THE TECH ENGINEERING NEWS

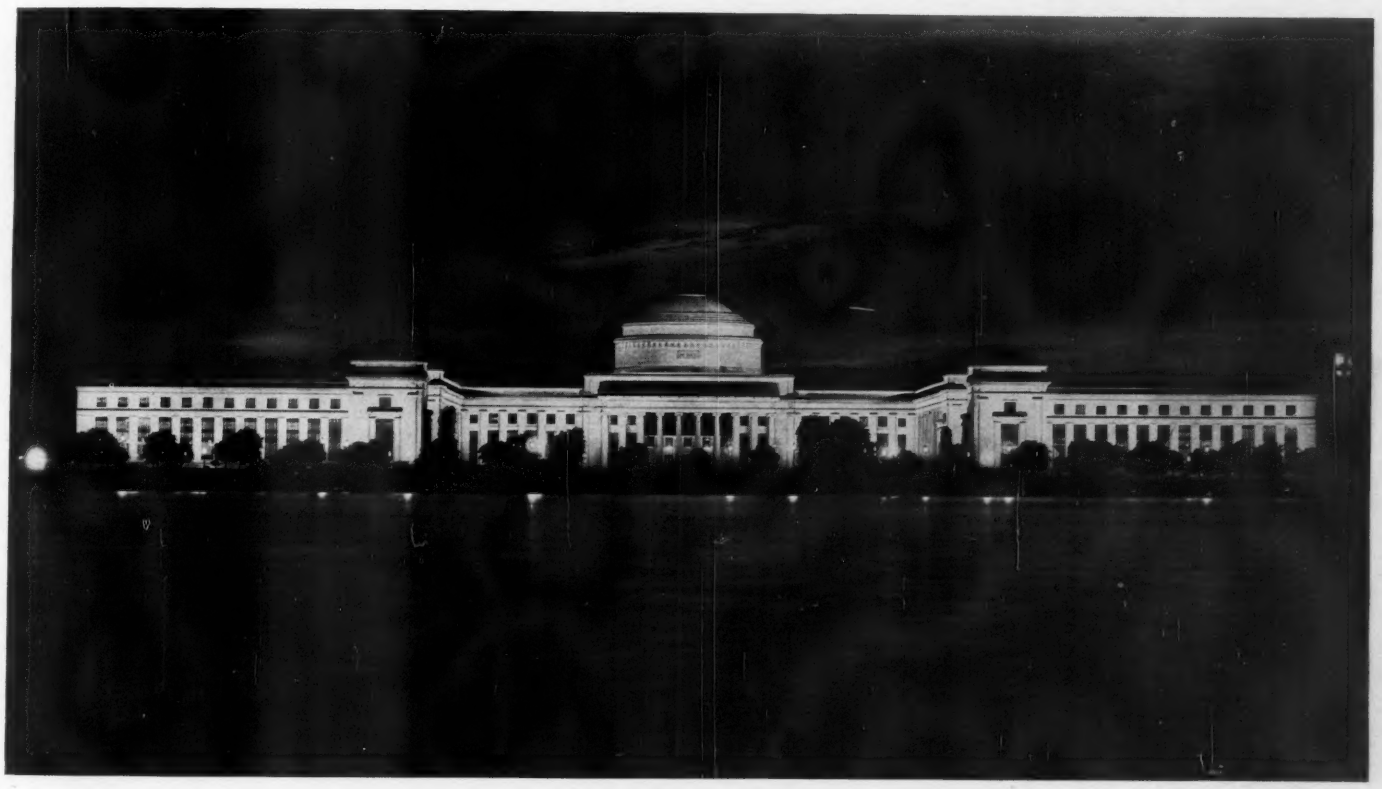
Volume XXV
Number 3

DECEMBER 1943

Twenty-Five Cents
The Copy

Jan. 7, 1944.
CIVIL ENGINEERING
CORNELL UNIVERSITY

THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY



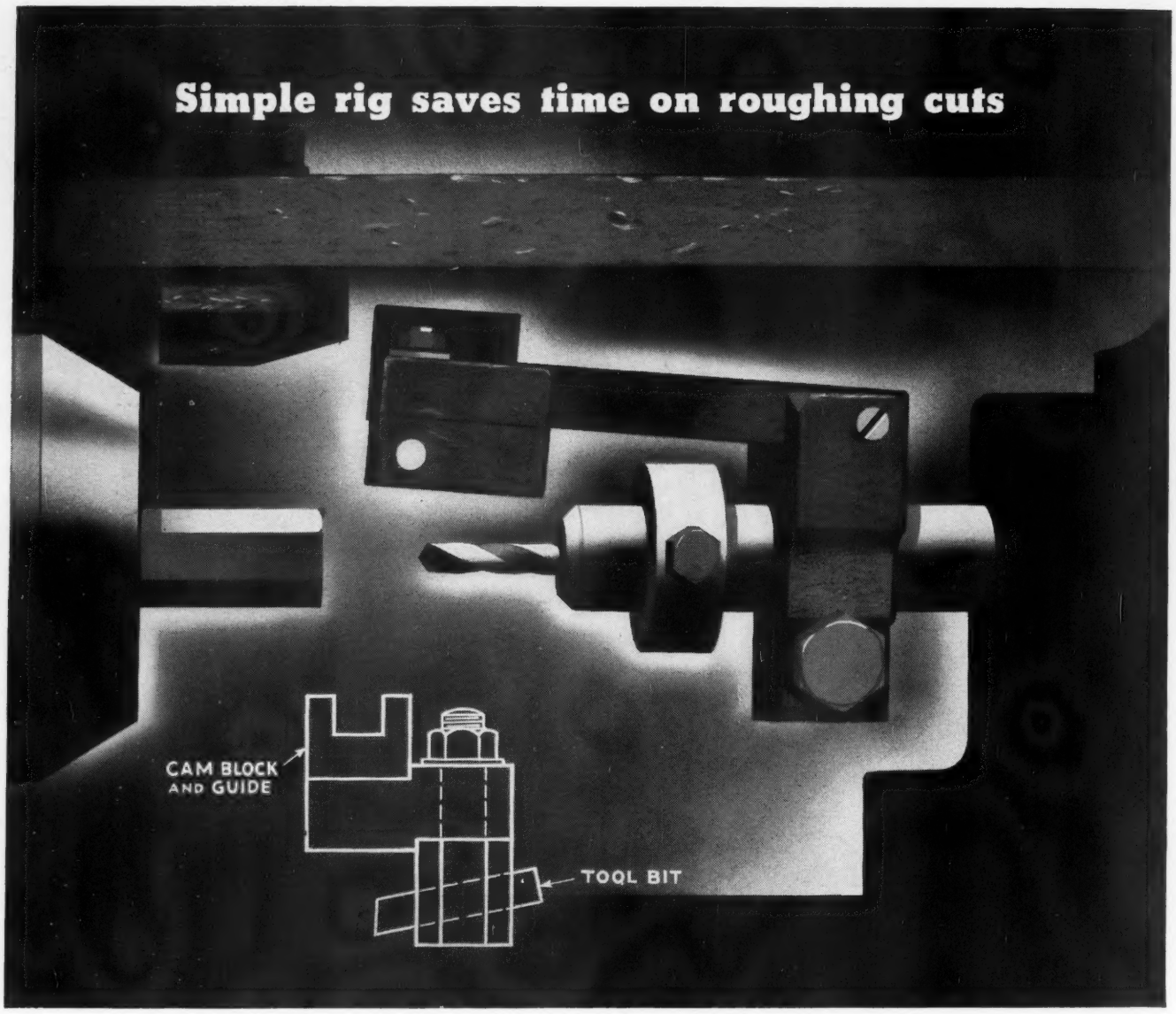
DEDICATED TO A BETTER WORLD

ANNOUNCING THE SERIES

THIS IS M. I. T.

INTRODUCED BY MR. B. A. THRESHER

Simple rig saves time on roughing cuts



Information supplied by an Industrial Publication

Roughing tools conventionally mounted on turret lathes or hand screw machines have a tough time cutting hex bar stock. Intermittent cutting, accompanied by successive severe shocks make frequent resharpening necessary. This means equally frequent machine shutdowns.

The problem of eliminating the lost time on such jobs has been solved in a New England plant by an ingenious rig applied to some old turret lathes.

The rig consists essentially of two bars. One, carrying the roughing tool, is pivoted to the turret. The other, having a very simple adjustable cam on its lower side, is fastened between the top of the turret and a sliding support on the headstock.

As the turret advances the roughing tool, the cam feeds it downward, then guides it horizontally and supports it transversely while the roughing cut is made. A drill or other inside tool may be fed in to work simultaneously.

When the roughing cut is finished, the tool is backed off, and the finishing tool fed in on the cross slide. When the roughing tool needs resharpening, it is simply a matter of a few minutes to take it out of the holder and put a sharp tool in. Shutting down is unnecessary. There is less need for expert grinding and resetting.

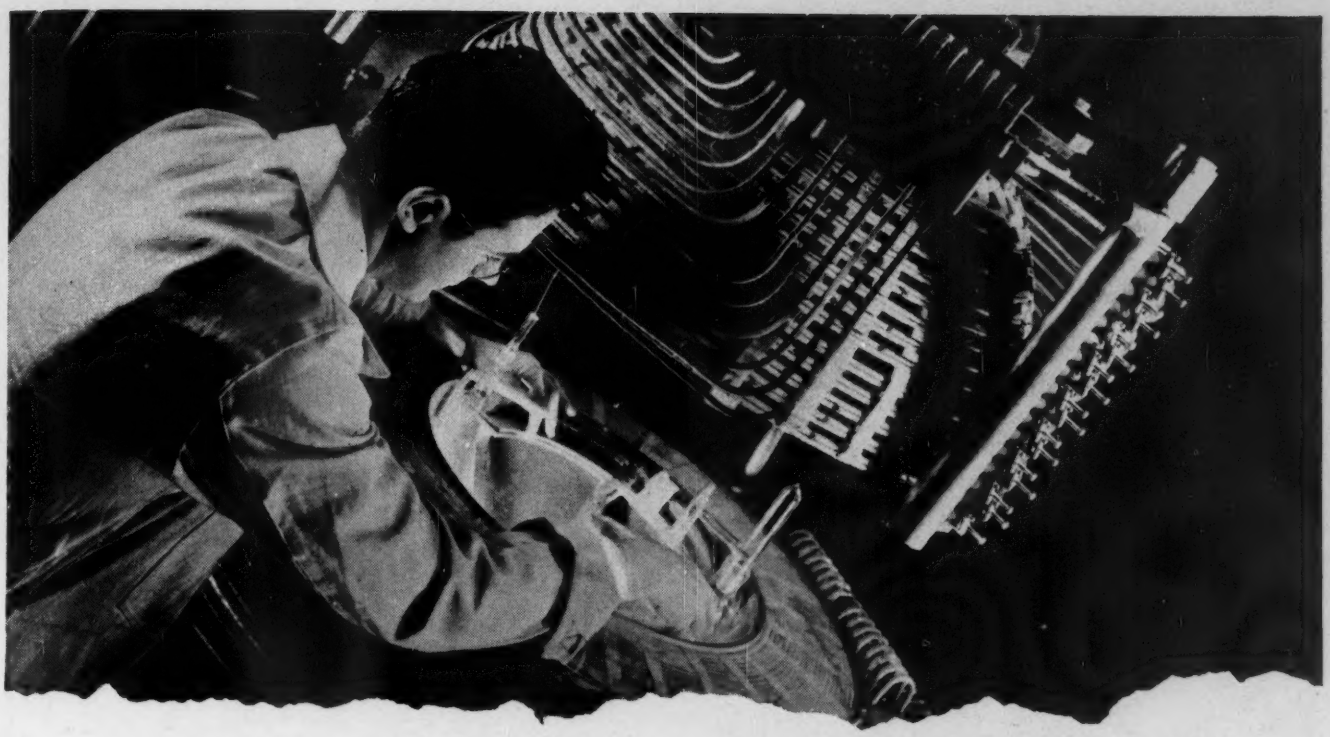
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City



Helping the tire maker: Pictured here is a laboratory model of the new Westinghouse-developed "mass spectrometer," an adaptation of which analyzes gases with incredible swiftness and accuracy. Right now, one of the most important of its many uses is speeding up tremendously a step in the making of synthetic rubber.

Westinghouse research accepts every wartime challenge . . .

Under the spur of war, Westinghouse research is delving into numberless mysteries, not only in the vast field of electricity and electronics, but also in chemistry, physics, metallurgy, plastics. And as a result, out of the great Westinghouse laboratories has come a steady stream of new war products, and new and better ways of making old ones.

Westinghouse research develops new talent for America . . .

To Westinghouse, each year, come several hundred budding scientists and engineers—to work, to learn, to blaze new trails in electrical research. And each year, through more than 100 Westinghouse scholarships, young men enter America's engineering colleges to develop the native skill and talent that have made America great and will make it greater.

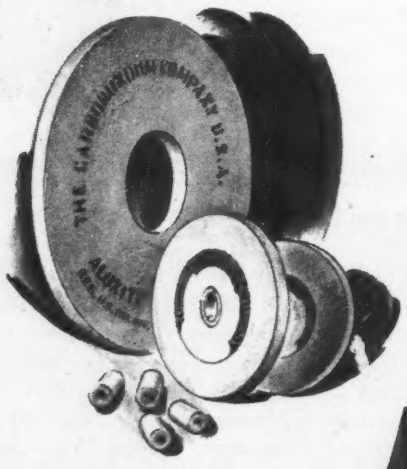
Westinghouse research promises new wonders for peace . . .

You have heard much talk of the marvels science will offer you after the War. Well, there *will* be marvels—plenty of them—and Westinghouse research is working to contribute its full share. But we will never lose sight of what we consider our first duty: seeing that, beyond all question, each Westinghouse product, old *or* new, is the very finest of its kind. Westinghouse Electric & Manufacturing Co., Pittsburgh, Pennsylvania. Plants in 25 cities, offices everywhere.

The glass "yardstick" that can't tell a lie!

Now they're making precision gages, on which mass output of planes and other weapons depends, out of glass. Why glass? It saves strategic material. Can't rust or corrode. Is less affected by heat. Surface scratches or knicked edges don't impair its accuracy. Costs less. Lasts longer. And it can't tell a lie. If a glass gage is dropped, either it breaks or is as good as new; there is no unsuspected distortion.

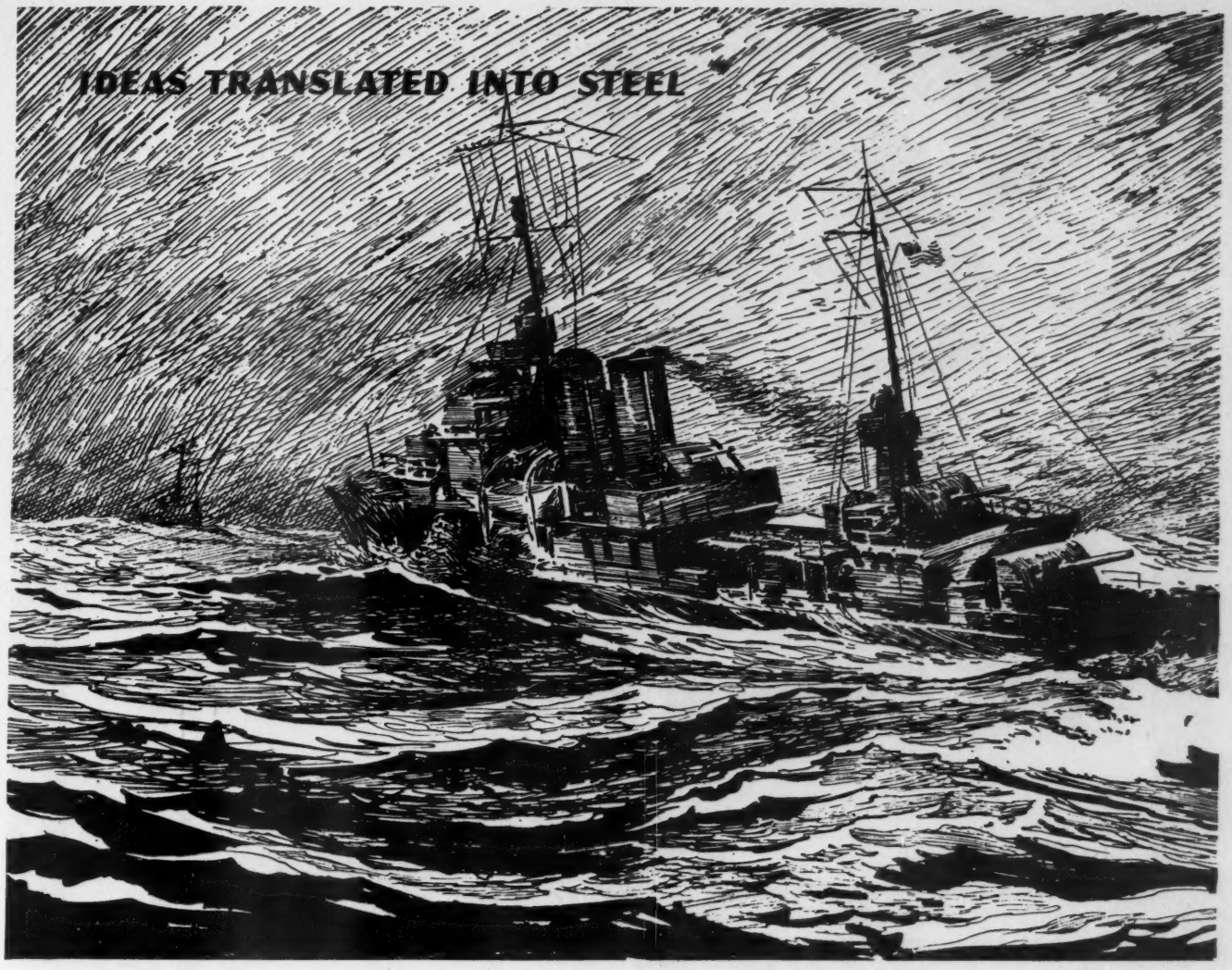
To turn molded glass into a precision instrument requires careful, accurate grinding. Carborundum makes grinding wheels with which plug, ring and snap gages of glass are quickly ground to the required accuracy and finish. This latest use of grinding is another example of the increasing importance of abrasives in war production.



When you get out into industry, remember that Carborundum research and experience are at your disposal, ready to help you solve any abrasive problem you may encounter. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
REG. U.S. BRAND PAT. OFF.
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company



Is that a destroyer we see disappearing into the mist? Yes and no! It is a destroyer, but mostly it's *two thousand tons of steel packed with ideas.*

That's what everyone means when we talk about better war implements. We're making our weight felt on the war fronts because we're getting there with plenty of good engineering ideas—translated into steel. Ships, planes, tanks, guns, mass production, transportation—all ideas.

That destroyer—some of the ideas in her are Budd ideas—translated into steel by Budd methods. The Budd plants—because they were filled with engineers and workmen trained to ideas and steel—are now working night and day on Army and Navy orders.

Most of the ideas now fighting for us weren't thought up for war. *They were conceived by free men in a free land for peaceful uses.* That's why we had a productive industry that is now the nation's main strength.

And that's why we can look forward with such confidence to America of the future; to a still better-equipped and more resourceful industry; to new ideas, some of them born from the war itself, that will make life fuller and richer for everyone.

EDWARD G. BUDD MANUFACTURING COMPANY • PHILADELPHIA • DETROIT

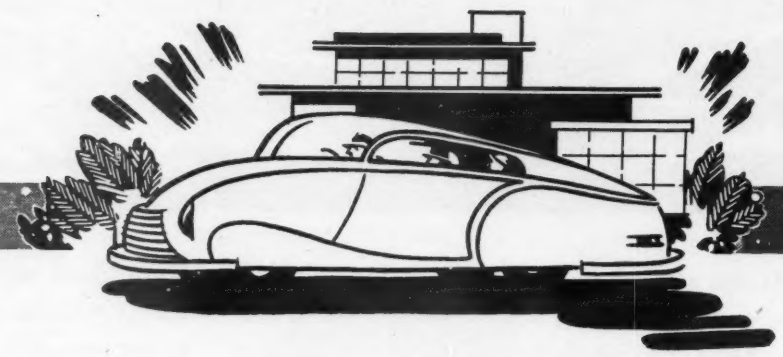
Budd

Originators of ALLSTEEL* *automobile bodies, stainless steel lightweight trains and highway trailers. Designers and makers of airplane and marine structures. Inventors of the* SHOTWELD* *system of fabricating hi-tensile steel.*

*REG. U. S. PAT. OFF.

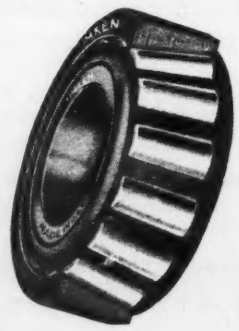
Knowing your Bearings

gets results in WAR and PEACE



MANY of the veteran engineers responsible for the design of the equipment that is winning the war—tanks, trucks, guns, airplanes, etc.—began to acquire their knowledge of Timken Bearings while in college. Now the results are telling on the battle fronts of the world.

When Victory has been won and industry calls you to help in the tremendous job of reconstruction, you'll find a thorough knowledge of the design and application of Timken Bearings one of your most valuable assets. Begin to acquire that knowledge now. The Timken Roller Bearing Company, Canton, Ohio.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

THE TECH ENGINEERING NEWS

PROFESSIONAL JOURNAL OF THE UNDERGRADUATES
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Volume XXV DECEMBER 1943 Number 3

IN THIS ISSUE

79 ANNOUNCING . . . *THIS IS M. I. T.*

80 WHAT'S PAST IS PRELUDE — BY B. ALDEN THRESHER

82 HIDDEN TREASURES FROM THE OCEAN — BY JOHN T. REID, 6–'45

86 TOMORROW'S CALENDAR? — BY CURT B. BECK, 6–'45

90 HIGHWAY OF THE FUTURE — BY CARROLL W. BOYCE, 10–'44

FEATURES

94 ALUMNUS OF THE MONTH
ALFRED P. SLOAN, '95

92 EDITORIAL
Navigating in Vacuo

96 DID YOU KNOW?
Facts about M. I. T.

MEMBER OF THE
ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Published monthly throughout the school year, at Walker Memorial, Cambridge 39, Massachusetts, by the undergraduates of the Massachusetts Institute of Technology. Entered as second class matter, at the Post Office, June 1, 1920, at Boston, Mass., under the Act of March 3, 1879. Copyright 1943 by The Tech Engineering News. Subscription per year $1.50. Foreign $1.75. One copy 25 cents.

MASSACHUSETTS INSTITUTE

ANNOUNCING

A SERIES OF ARTICLES

Entitled

THIS IS M. I. T.

WITH this issue, THE TECH ENGINEERING NEWS inaugurates a series of articles about the various undergraduate courses offered at the Massachusetts Institute of Technology. This series is designed to acquaint past, present and prospective students of the Institute with the present and projected scope of its educational program.

T.E.N. considers itself fortunate indeed to be able to present an introduction to this series written by Mr. B. A. Thresher, the Director of Admissions. As a title for Mr. Thresher's work we have chosen a particularly significant phrase which he used therein: "What's past is prelude."

Dean Thresher presents what we believe is, to date, the best published comprehensive review of the growth of the Institute and its aims for the future. In clear terms he explains why Tech is today the leading engineering school in the world, and why it will retain that position in the days to come. He explains, too, the basic educational principles upon which instruction is conducted at Technology, how they differ from the classical interpretation of "an engineering education," and why these differences place the Institute in its pre-eminent place in the field of technical education.

We feel that this series of articles will serve at least two vital purposes. First, it will better acquaint the alumni with the rapidly changing Institute; keep them abreast of the times. They may thus become informed of how their Course and other Courses have been altered and will be altered in the future to meet the changing conditions, and most important, it will tell them *why* these changes are taking place. The second purpose is perhaps the more important, especially to the Institute, and that is presenting to prospective students a comprehensive and at the same time highly interesting survey of the educational opportunities at the Institute. We do not intend that this series shall "compete" with the Institute catalogue, but rather supplement it, by giving a colorful description of the activities of the various departments, its facilities, and the opportunities in the field for which it is preparing the student.

To bring this second aim to a more complete fruition, THE TECH ENGINEERING NEWS is delighted to coöperate with the Institute by entering into a special arrangement whereby this and succeeding issues of T.E.N. will be distributed free to some two hundred top-flight high schools and preparatory schools. Thus the magazine will be more readily available to those whom this series of articles will benefit most: the Technology students and alumni of many tomorrows.

And now, may we commend you to Mr. B. A. Thresher, the Director of Admissions, and "What's Past is Prelude."

Carroll W Boyce

General Manager

WHAT'S PAST IS PRELUDE

By B. ALDEN THRESHER

Director of Admissions

Massachusetts Institute of Technology

THE series of articles which THE TECH ENGINEERING NEWS intends to present on the work of the various departments of the Institute affords an opportunity to take stock of Technology's facilities at a time when thoughts begin to turn toward the postwar era. Even at the present moment, with war activities absorbing the major efforts of staff and students, it may be wise to look forward to that new epoch so that the future may not find us unprepared. "What's past is prelude"; eighty odd years of growth and accomplishment have prepared Technology to play an effective role in that better time to which we look forward. A glance backward at the conditions under which it began will help to make clear its role in the next few years.

Founded at the beginning of the Civil War, the Institute's growth paralleled that of American industry in its most expansive era. It is more than a historical coincidence that the Institute received its charter of incorporation at the close of that decade during which the railway network of the United States was expanding at a rate which (proportionally) has not been equalled either before or since.

Industry was beginning to grow out of its earlier phase of small, local enterprise, and laying the foundation for the industrial expansion which was the outstanding economic phenomenon of the last third of the nineteenth century. Under these conditions, if an M. I. T. had not arisen, "it would have been necessary to invent one." But the long foresight of William Barton Rogers had got the project under way and functioning in time to catch the full force of the economic surge. Men with a thorough scientific and technical training began to come on the market in time to participate in the unprecedented development of industry which characterized the period following 1870. Because they were solidly trained and competent, these men performed well, and the fame of the young institution quickly spread, first in the United States, and later in regions like China and South America, where civil and mining engineers found undeveloped resources at hand.

It is well known that Technology instituted the first school of architecture in this country, and was the first to establish courses of study in such fields as chemical engineering, engineering administration, aeronautical engineering, public health and food technology. It is more difficult for us, however, now that technical education has become a commonplace, to realize the extent to which the Institute's very establishment and existence represented a unique and path-breaking experiment. When the Institute was founded it was a unique phenomenon. The pattern which it established was a valid one, as attested by the fact that there are today over fifty degree-granting engineering colleges in the United States, either as parts of universities or as independent schools, besides a much larger body of technical schools on lower levels.

The dominant tradition of the nineteenth century university was classical and theological. Only here and there did a Silliman, an Agassiz or a Gibbs appear, as isolated harbingers of the extraordinary flowering of science which was to come. Public opinion was still far from appreciating the scope and significance of the natural sciences, and Rogers was ahead of his time in proposing a school of applied science. His achievement, moreover, was twofold. First, he introduced the laboratory method of instruction, an educational device never before systematically used. This has become so much a commonplace that we find difficulty in appreciating what an innovation it was at the time. Second, he succeeded in retaining the exacting intellectual standards which characterized the best work of the universities, while harnessing science to the solution of pressing practical problems of industry, transportation and health. Perhaps never before has a happier marriage of theory and practice been effected than this one which Rogers initiated. It is notable that the technical innovations of the industrial revolution in England had been for the most part on the simple, practical plane of shop mechanics. The very considerable scientific resources of the universities of the period, particularly

those of the continent, were not brought to bear in this movement whose social and economic consequences were to be so profound. It was not until the last third of the nineteenth century that a truly fruitful synthesis of theory and practice was consummated.

An epigram attributed to Charles F. Kettering aptly illustrates the situation. The difference between the theorist and the practical man, said Kettering, is something like this: the theorist knows where he wants to go, but he does not know how to get there. The practical man *gets there* — and then finds he is in the wrong place. It was in striking a just balance between these two incommensurable opposites that Rogers opened a new epoch in education. This intermixture of the theoretical and the practical has made American technical education preëminent. The British, on the other hand, never quite pulled it off. The universities went their own way, and did distinguished work in pure science. The fertilizing effect of this work never acted with full vigor in the shops and factories. Engineering education remained predominantly on what we should now call the "technical institute" level, separated by a deep gulf from the universities. British industry, in consequence, fell into a rut of "rule-of-thumb" methods, while German industry, from the time of Bismarck, forged ahead because it was more hospitable to the scientific viewpoint.

The continental tradition, particularly in Holland, Switzerland and Germany, yielded a more effective combination of theory and practice than the British. In one respect, however, it definitely lagged behind the American engineering as exemplified by M. I. T. The Technische Hochschule never attempted to give even the elements of a liberal education to its students, who were early marked for relentless and narrow specialization. Even the Gymnasium, essentially a classical secondary school, developed, as variants, the Realgymnasium and the Oberrealschule, so that the student destined for a technical career found himself specializing at an early age. On the other hand, at Technology, from the days of Francis Amasa Walker, the humanities have kept a place in the curriculum. History, literature, economics, psychology are not deemed foreign to the interest of the engineer who, after all, must work through human agents and organizations. In the broad sense, science and engineering are themselves numbered among the humanities, and are not to be thought of as antithetical to the humane tradition, or in conflict with it. The technical man is the better for having an eye to the larger aspects of his job, and its place in the social process.

It is due in no small part to this early bent of the Institute that American technical education has retained some elements of breadth. Our engineering schools have turned out not merely experts, but also a high proportion of leaders in civic affairs, government finance and business. It was realized from the start that the higher a man rises in his profession, whatever that profession may be, the more largely he must concern himself with problems which are, broadly speaking, social rather than technical. Whether these problems be administrative, financial, social, economic or governmental, to cope with them will demand that breadth of judgment which a liberal education helps to develop. While the time which an engineering student can devote to the humanities is limited, there is nevertheless opportunity to open doors on a number of fields of thought which the student of alert mind will explore for himself as time goes on and occasions present themselves.

The harnessing of science in the service of industry implies something more than simply teaching "applied" subjects. The Institute has in many ways put out tentacles which bring it into close and fruitful contact with the world of industry. The Division of Industrial Coöperation has for many years served as a link between the laboratories of the Institute and problems which industry wants solved. Experiments in "coöperative" work between industry and school date back almost as far. In the same spirit we find the Chemical Engineering Practice School, and the year spent at sea by students in Marine Transportation. The Section of Industrial Relations looks beyond the academic walls at a group of human problems in industry. An institute in which activities of this kind are going on is not likely to become insulated from the currents of everyday life, or to sink into cloistered calm.

In sum, then, the Technology tradition embodies first, the highest standards of research and instruction in pure science; second, a willingness to place these at the service of industry in the solution of its pressing practical problems; and third, an insistence that at least the elements of a liberal education should enter into the preparation of every scientist and engineer.

Now let us look for a moment at the kind of institution which eighty years of these principles have produced. We find first of all, advanced research and instruction in pure science, carried on in close contact with many branches of engineering, architecture and city planning. While the greater part of the Institute's instruction will continue to be on the undergraduate level, the presence of advanced students and of many opportunities for research exercises a stimulating effect on staff and students alike. Furthermore, there is no sharp boundary between pure and applied science. What is today of purely theoretical interest may tomorrow be of the utmost practical importance.

We find training kept on a broad, professional level emphasizing principles and not directed to specific industries or processes. Broadly speaking, students learn *why* things are done, not merely *how* they are done. We find a plant which houses practically under one roof a staff of specialists in very diverse fields, and much specialized laboratory equipment. This characteristic of physical planning has an importance which goes far beyond mere convenience or aesthetic symmetry. The ease of access by all to all, the elastic space arrangements, do much to promote interdepartmental coöperation. A new research problem or a new program of instruction can draw on men and equipment from many departments. The result, whether in investigation or in teaching, is a joint result, often much more satisfying because embodying the efforts of diverse specialists. Interdepartmental committees are set up on many projects. In these ways, the natural isolationism which characterizes most university departments is counteracted. The Institute is, therefore, in a very real sense, greater than the sum of its parts, and its accomplishments far exceed the arithmetic aggregate of what its individual departments could separately achieve.

The reader of this series should bear in mind, as he sees the Institute's facilities and equipment passed in review, that these things are of minor importance compared with the men who operate them. The destiny of Technology, in the next eighty years, as in the last, is a matter of people, not of things. It depends on the breadth, the acumen and the energy of its staff, and perhaps equally on the calibre and attitude of its students. "To be well instructed you must love instruction." In this sense, the future of Technology as an educational institution rests in the hands of its students.

HIDDEN TREASURES FROM THE OCEAN

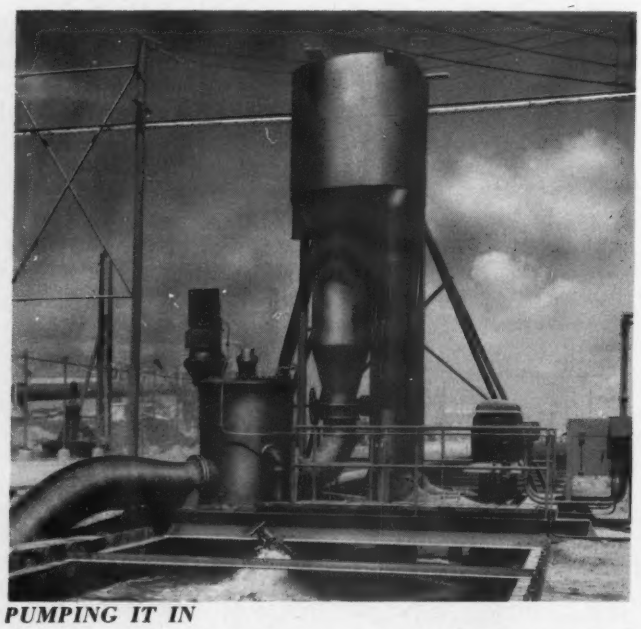
By JOHN REID, 6–'45

Pictures courtesy Dow Chemical Company

AT some time you must have noticed that the salt water of the ocean is not colorless and clear like the salt water you use for gargling. If you were to evaporate ocean water, you would find minute bits of salt on the bottom. Besides common table salt, sodium chloride, you would find salts of potassium, magnesium, calcium, gold, silver, copper and iron. The magnesium salts can be transformed into metallic magnesium through a practical, but complicated process.

The Dow Chemical Company until recently produced all of its magnesium from the salt brines in the vicinity of Midland, Michigan, through a unique and continuous production process that particularly fitted the conditions at Midland.

The process for electrolyzing anhydrous magnesium chloride to produce the metallic magnesium was efficient for small scale production but when the demand increased, new methods had to be developed. It became necessary to build up a greater knowledge of the metallurgy of magnesium, to develop more alloys and to determine their properties and possible applications. Magnesium is the third most abundant engineering metal, comprising about eight per cent of the earth's crust. Dowmetal, a magnesium alloy, is one-fourth the weight of iron, two-thirds the weight of aluminum, and has exceptional strength, toughness and durability.



PUMPING IT IN
Ten thousand gallons of sea water per minute are raised from a flume into the plant by this pump

When the commercial use of the metal was finally appreciated, a call went out for increased production. Since the Dow company had had several years experience in extracting bromine from the ocean, they looked to the ocean as a cheap source of the raw material. They began construction in March, 1940. Possible plant sites all along the Gulf had been studied before Freeport, Texas was picked. The site had to be close by to available supplies of salt, sulphur, lime and natural gas. Furthermore, the site had to be situated so that the raw material could be pumped in at one side of the plant and discharged in such a way that it would not affect the incoming water.

An ideal topographical situation was on the tongue-shaped neck of land in Freeport Harbor. A harbor and deep sea channel had been created in 1929 by the United States Engineers Corps when the former channel of the Brazos River was dammed five miles from its mouth. This diverted the river into a new channel and it now flows directly into the Gulf, about five miles south of its former mouth. Because of this situation it was possible to select a plant site bordered on three sides by ocean water, but so placed that the waste water could be diverted through a disposal canal into the Brazos River at least seven miles from the plant intake. The site was so well suited for ocean extraction that it was also chosen for the site of the bromine plant of the Ethyl Dow Company.

Ten months after construction was started, the first metallic magnesium was produced. The plant was built to take one cubic foot of magnesium per 1,000 cubic feet of ocean treated, and to treat 12,000,000 gallons of water a day. At that rate it would take 800 years to extract the 5,700,000 tons of magnesium present in just one cubic mile of ocean. That mine is not likely to run out soon, as there are some 417,885,000 cubic miles of water in the ocean. If the Texas plant met their 125,000,000 pound quota set for 1942, they must have produced 14 times the 1940 production, and 100 times the production of seven years ago. Production has increased in 25 years from 87,500 pounds annually to 17,000,000 pounds, while the price has dropped from five dollars per pound in 1915 to 22½ cents per pound in 1942.

The development of a commercially successful process to utilize such a dilute solution (one part of magnesium in 770 parts of ocean water) called for unusual chemical engineering equipment, methods and control.

As the water flows into the intake of the plant, it is fed into a ten-foot flume that traverses the plant site and carries the stream of raw material for both the

FILTERING THE MAGNESIUM HYDRATE
Here the magnesium hydrate is being filtered from the mother liquor. A 100-ton crane is needed to hoist the filters from the tanks

magnesium and bromine operations. The water flows into large precipitation containers where it meets a milk-of-lime slurry. This slurry is obtained from oyster shells, which are dredged from the harbor and sent up to the plant on barges. The oyster shells are roasted and cooked into lime (CaO). Then this lime is dissolved in water where it forms calcium hydroxide — known commercially as lime water.

$$CaO + H_2O \rightarrow Ca(OH)_2$$

The magnesium, which is dissolved in water as magnesium chloride, combines with the calcium hydroxide to precipitate magnesium hydroxide.

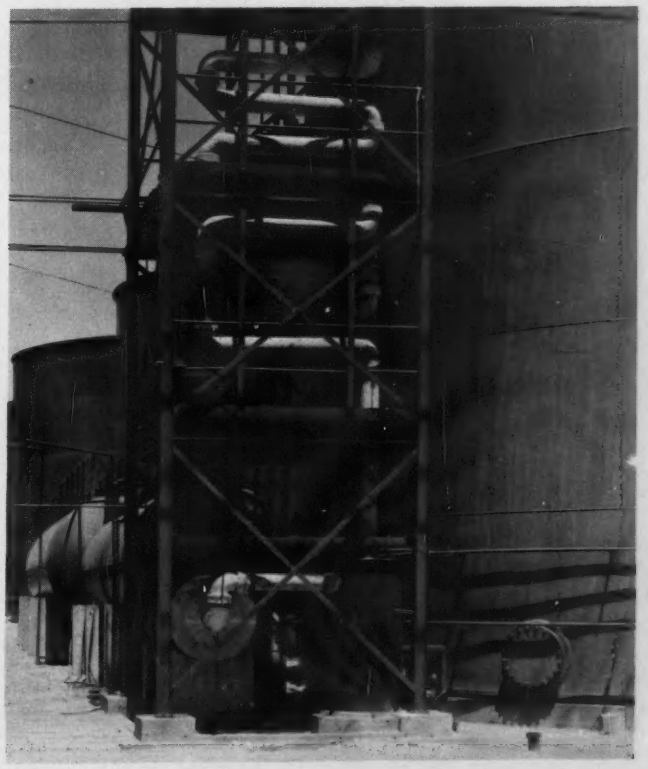
$$Ca(OH)_2 + MgCl_2 \rightarrow \underline{Mg(OH)_2} + CaCl_2$$

This magnesium hydroxide is then filtered and added to a ten per cent solution of hydrochloric acid (HCl), which is manufactured in another part of the plant. A reaction takes place which converts the magnesium hydroxide back into magnesium chloride.

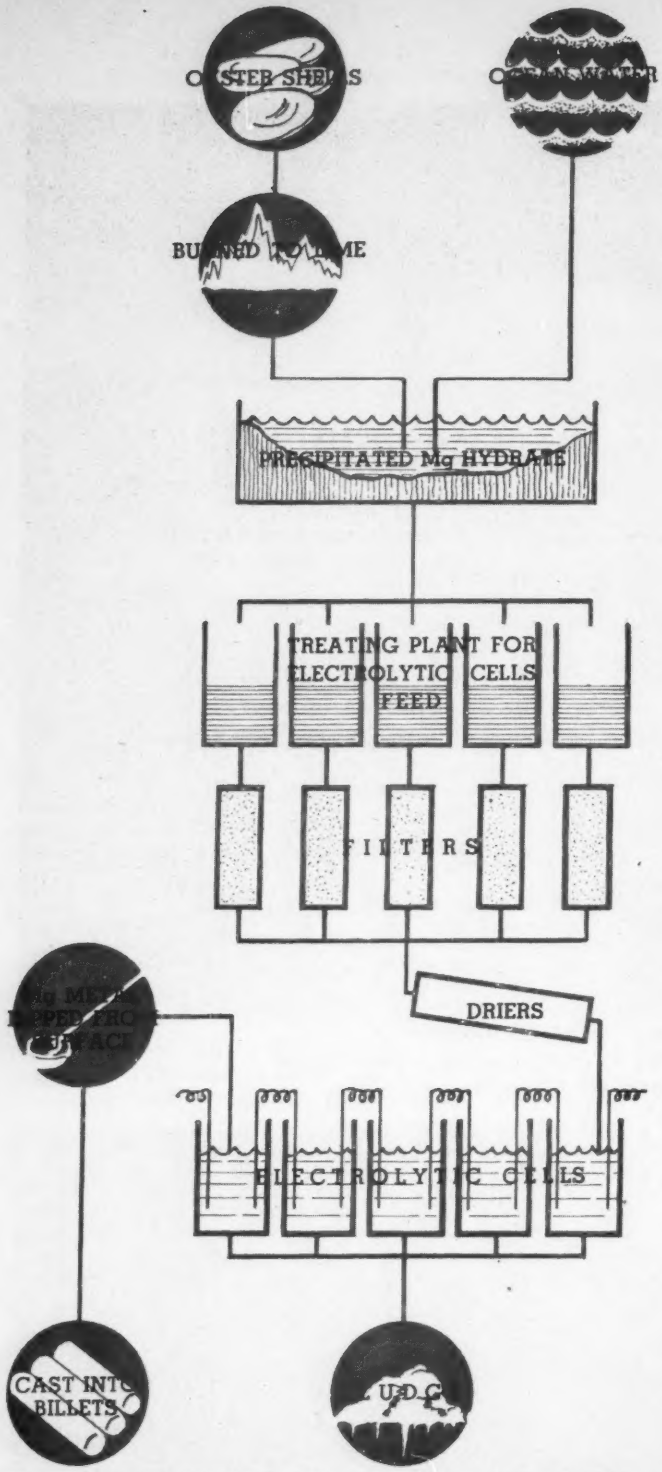
$$\underline{Mg(OH)_2} + 2HCl \rightarrow MgCl_2 + 2H_2O$$

The reason for changing the magnesium chloride of the ocean into the hydroxide and back to the chloride again is that besides the chloride of magnesium there are also the chlorides, bromides, and iodides of silver, sodium, and potassium dissolved in the ocean. Therefore, by this simple operation a large amount of magnesium chloride with a high degree of purity is obtained.

The magnesium chloride solution is then concentrated and dried in three sub-steps. The first of those sub-steps takes place in the direct-fired evaporators.



Giant storage tanks in the Texas magnesium-from-sea-water plant



Diagrammatic flowsheet of Freeport plant process showing in brief how magnesium is produced from sea water

The dilute magnesium chloride solution is sprayed into the top of a furnace in which natural gas is burned under pressure, and most of the liquid is deflected down the side walls. The steam along with the products of combustion, passes through another steel-tower and finally into one of asphalt-impregnated wood, where baffles or obstructions remove the entrained water and solution.

The concentrated magnesium chloride solution from the direct-fired evaporators next goes to the shelf-dryers, where it is partially dried. This semi-dried material from the shelves, from which perhaps two-thirds of the water of crystallization has been removed, receives its final drying to practically anhydrous (without water) condition in a gas-fired rotary dryer where it is mixed with previously dried material in flake form.

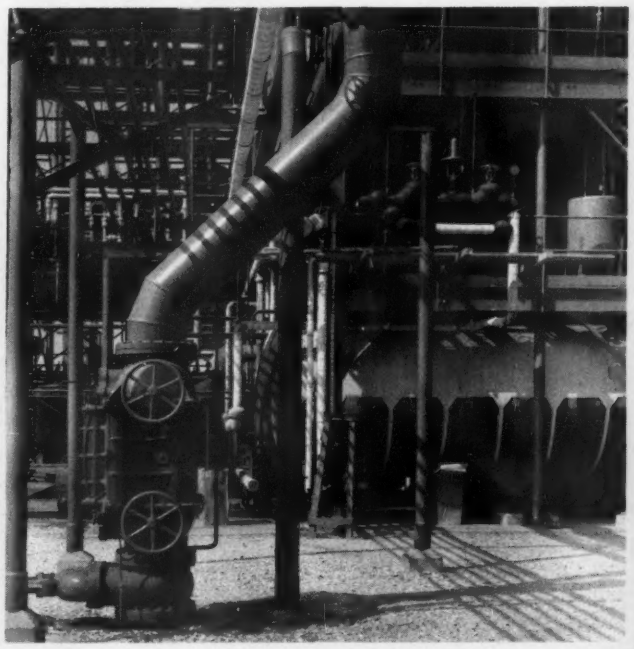
The material is then fed into rectangular, cast steel pots set in refractory furnaces. The steel pot serves as the cathode in the electrolysis. Graphite electrodes enter the open top of the furnaces. The electrolyte is kept in molten condition, and the magnesium chloride charged to the cell bath is converted with metallic magnesium in the ratio of about four tons of magnesium chloride to one ton of metal. Each cell produces about 1,000 pounds of metal per day. The molten magnesium, whose average purity is between 99.9 and 99.95 per cent, is dipped from the cells and cast into 18-pound pigs for ease in handling. A by-product of the electrolysis is chlorine, which is used to make the ten per cent hydrochloric acid solution.

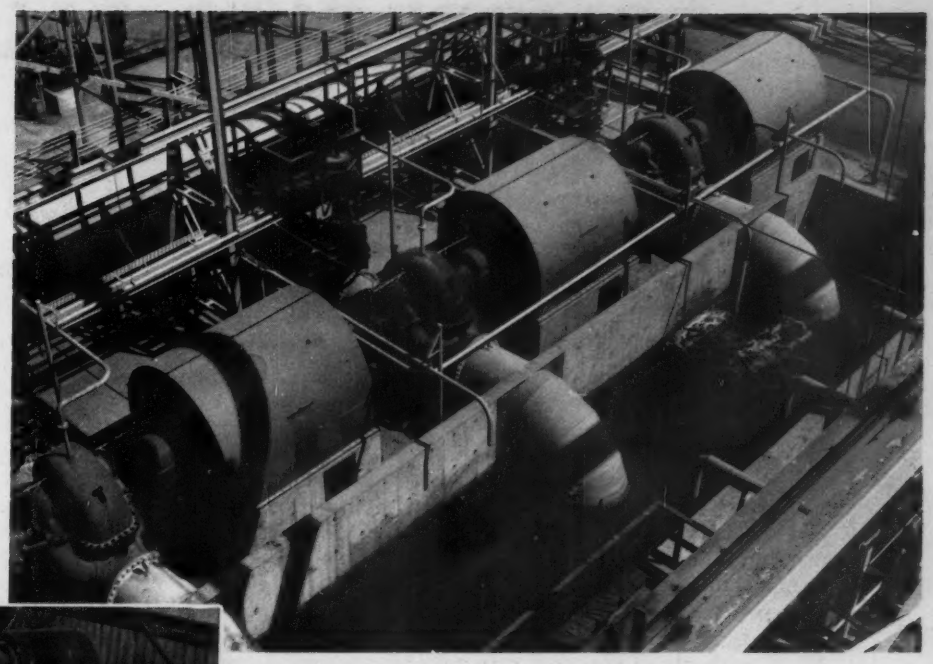
Today 100 per cent of Dow's production is going into the war effort, mostly for aircraft parts. The aviation industry's demands for magnesium are reaching truly vast proportions. On top of these requirements are the almost limitless quantities that are needed for incendiary bombs and other military pyrotechnics. As a result, plans for construction of a large new plant by a second producing company have been announced, and reports have been circulating that as many as twelve or fifteen companies are contemplating magnesium production.

By using the process of extraction from the sea as a basis, the scientists of the near future may be able to develop a whole new mining industry. There would be several advantages to this type of mining. Since the plants would be right on the coast, the cost of transportation to and from the plant would be very low as compared with the cost of overland transportation for mines which are in the mountains. Except for the renting or buying of the plant property, the cost of the original layout would be almost nothing.

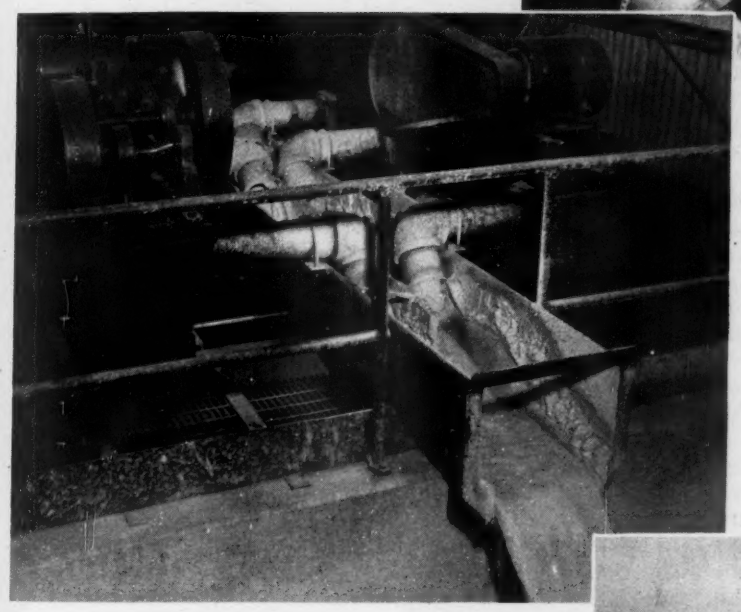
Magnesium may, after the war, replace many metals. It could be used extensively in automobiles, as it is now used in airplanes, and make the machine lighter and cheaper. It will take the place of metals now used in pots and pans, stoves, refrigerators, motors, and other household articles. In the years to come, magnesium may be called the miracle metal.

PIPE LINES
One section of the miles of pipe lines in the magnesium plant

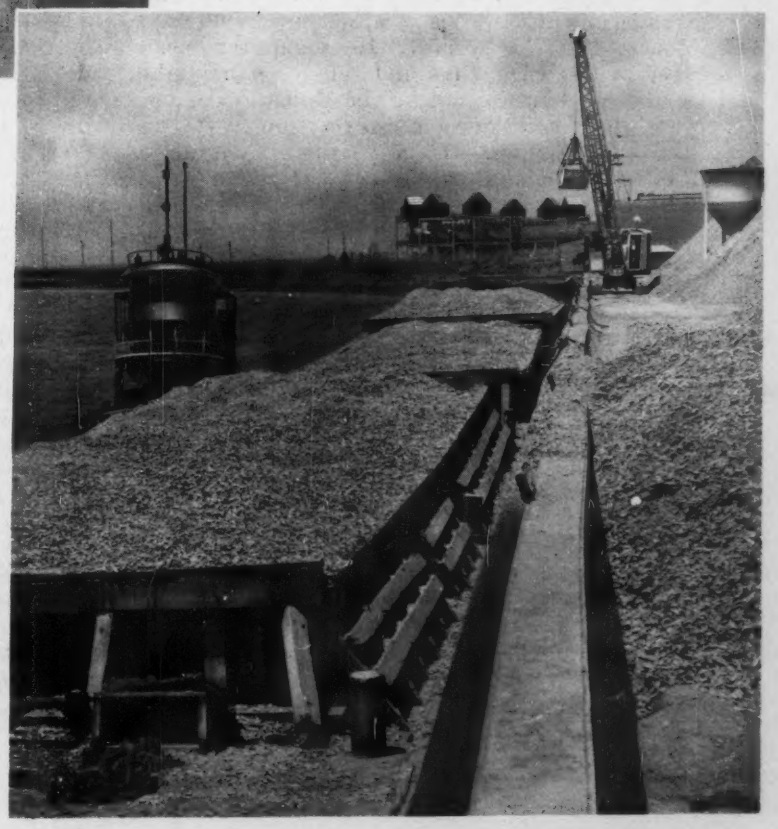




Ocean water intake pumps in the plant



Magnesium hydrate



FROM OYSTERS TO MAGNESIUM

Oyster shells are dredged from the bottom of Galveston Bay, then barged to Freeport Harbor, washed and calcined to make the lime that precipitates the magnesium hydrate from the raw ocean water.

TOMORROW'S CALENDAR?

By CURT B. BECK, 6-'45

Editor-in-Chief, The Tech Engineering News

THIS is the day and time that everyone is thinking about far-reaching improvements of our living conditions. Post-war planning worked out to the most minute detail, in fact, a complete social and economic revolution is staring us in the face — the proposal and adoption of highly idealistic governmental policies confronts us on all sides and we are assured again and again that, comes the peace, we will never again see the world we were used to back in the twenties and thirties. Along with all of the post-war panaceas comes a suggestion which has struck the editors of TECH ENGINEERING NEWS as being worthy of much more credit than it has yet received. This is the World Calendar reform plan, also known as the 12-month Equal Quarter plan, which, if adopted, we think will contribute as much to human comfort and orderly living as any other single post-war proposal. But this is not an editorial, so let us investigate the facts of the matter, for this sensational idea has as its basis good common sense backed by a long-needed reform in our method of counting the days.

It was primitive man who made the first contribution towards regimenting our daily actions when he divided the day into 24 hours. The Babylonians divided the hour into 60 minutes and the minutes into 60 seconds. The 12 moon cycles of 29½ days each soon gave rise to the concept of integrating the four seasons into a year, and Julius Caesar was the first one to do anything concrete in this respect. He found the mean solar year to be 364¼ days and thus originated the first of the modern calendars, the Julian calendar. Leap year was of course necessary every fourth year to keep the balance. The Julian year was inaccurate itself and missed being a true year by 11 minutes and 14 seconds, or one day in 128 years, an error which amounted to 10 days by the time of Pope Gregory XIII in the sixteenth century. After five years investigation of the problem, Pope Gregory established the modern or Gregorian calendar, skipping 11 days and eliminating leap year in all centenary years except those divisible by 400 to correct the mistake. Modern astronomy has found that the solar year is 365 days, five hours, 48 minutes, and 46.15 seconds, and the latest revision of the calendar has proposed that the year 4000 and all its multiples not be leap year to make the final correction.

An interesting fact about the English adoption of the Gregorian calendar (several years after the Catholic countries had adopted it by papal edict) was the fact that the 12 days between September 2 and September 14, 1752, were skipped. Even then labor unions were active, and the guild leaders were greatly set back when their demand for pay for the missing 12 days was refused. Among other changes brought about by this step-up of time, Washington's birthday was moved from February 11 (the actual date) to February 22 (the date by the Gregorian calendar).

The faults of the Gregorian calendar are obvious and numerous. The main objection to it is its complete lack of organization and its incongruity. One can never tell the number of days in a month, the date a certain day will fall on, or the day a holiday will fall on without a complicated recital of Elizabethan rhymes, counting on the fingers, or consultation of a calendar. Every year is different from every other year, and holidays hop from day to day in different years like a grasshopper. In this day of precise measurements, planned time, and the eternal struggle for maximum efficiency this old calendar appears to have no place.

Of the two feasible plans which have yet been offered to reform the calendar, the World Calendar is by far the most satisfactory. (George Eastman's 13-month 52-week year idea has recently been dropped as impractical.) The World Calendar is simplicity itself, as illustrated in the accompanying diagram. Contrary to the Eastman calendar, the World Calendar has only 12 months with the same names as they had before. The year is divided into four quarters, each containing three months of 30, 30, and 31 days respectively. Each of these quarters is of equal length, 91 days, and begins on a Sunday and ends on Saturday. An extra Saturday is thrown in after December 30 to make 365 days. Two extra Saturdays are included in leap year, the other one occurring after June 30. Both days are holidays. Every year is the same as every other year in all respects, since every date always occurs on the same day of the month any year.

The high point of the World Calendar is, of course, that it offers a solution to nearly all of the bad points of the Gregorian. Its main virtue is its simplicity, but it also offers ease of adoption combined with only a modicum of changes of the position of the days in our old system.

The group profiting the most by this arrangement will be the business men. These men suffer the most of any occupation from the vagaries of our method of indicating our position in the solar orbit. With every day of every month the same over a period of years, it would greatly simplify planning for future sales, something which merchants have to leave to judgment and chance at present. No longer would the business man have to compare a five-Saturday September (as in 1944) with a four-Saturday September (as in 1943) and be required to judge sales by such a comparison. Moreover, with holidays stabilized as proposed in the plan, unevenness of demand will be largely done away with, as in the case of Easter. Easter, which can vary anywhere from March 22 to April 25 (thanks to a decree of the Council of Nicaea in 325 A.D.) would be fixed as

(*Continued on page 96*)

Tech Engineering News Endorses . . .

THE WORLD CALENDAR

PRESENT GREGORIAN CALENDAR

1943

FIRST QUARTER

	S	M	T	W	T	F	S
JAN						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31						
FEB		1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28						
MAR		1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	31			

90 days

SECOND QUARTER

	S	M	T	W	T	F	S
APR					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	
MAY							1
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31					
JUN			1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30			

91 days

THIRD QUARTER

	S	M	T	W	T	F	S
JUL					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
AUG	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
SEP				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30		

92 days

FOURTH QUARTER

	S	M	T	W	T	F	S
OCT						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31						
NOV		1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30				
DEC				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	

92 days

This calendar has 52 weeks and must borrow from another week to complete the year. This causes the calendar to change every year and is responsible for its confusion. Also note varying number of days in each quarter.

PROPOSED WORLD CALENDAR

FIRST QUARTER

	S	M	T	W	T	F	S
JAN	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
FEB				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30		
MAR						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30

91 days

SECOND QUARTER

	S	M	T	W	T	F	S
APR	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
MAY				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30		
JUN						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
							**

91 days

THIRD QUARTER

	S	M	T	W	T	F	S
JUL	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
AUG				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30		
SEP						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30

91 days

FOURTH QUARTER

	S	M	T	W	T	F	S
OCT	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
NOV				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30		
DEC						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
							*

91 days

★ A WORLD HOLIDAY, DECEMBER W, the Year-End Day, an extra Saturday, follows December 30th every year.
★★ A WORLD HOLIDAY, JUNE W, the Leap-Year Day, another extra Saturday, follows June 30th in leap years.

EACH YEAR DIFFERENT

This calendar is always different from year to year.

The quarters are unequal in length. In leap years the first half-year has 182 days; the second, 184 days.

Each quarter begins and ends on a different day of the week.

Each month begins and ends on a different weekday.

The months have a varying number of weekdays.

Each year begins on a different weekday.

This calendar is unbalanced in structure, unstable in form, and irregular in arrangement.

EACH YEAR THE SAME

This twelve-month equal-quarter calendar is the same for every year.

The quarters are equal in length.

Each quarter begins on Sunday and ends on Saturday, contains three months — 13 weeks — 91 days.

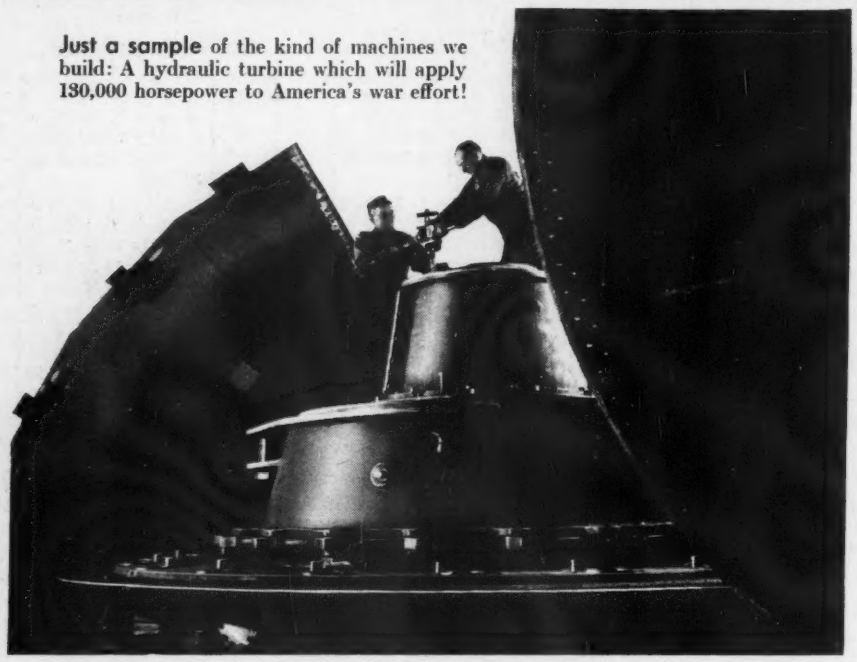
Month-dates always fall on the same weekdays. Each month has 26 weekdays — plus Sundays.

Each year begins on Sunday.

Year-End Day and Leap-Year Day, the extra Saturdays, are World Holidays.

This revised calendar is balanced in structure, perpetual in form, harmonious in arrangement.

Just a sample of the kind of machines we build: A hydraulic turbine which will apply 130,000 horsepower to America's war effort!



Power

TWO BIG JOBS! And Allis-Chalmers is helping do both. This unusual company makes 1600 industrial products—everything from equipment that helps make and shape steel and aluminum for U. S. airplanes to giant turbines for U. S. power plants.

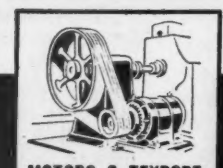
THAT SUPER CARGO PLANE is like something out of the future. You didn't expect to see it for years. Yet there it is . . .

America's great industries are cramming years of aviation advancement into months. And Allis-Chalmers is working at top speed to help them produce more and better planes.

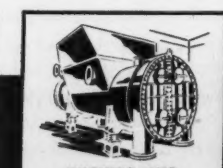
Huge Allis-Chalmers turbines help gen-

ELECTRICAL EQUIPMENT

STEAM AND HYDRAULIC TURBINES


MOTORS & TEXROPE V-BELT DRIVES

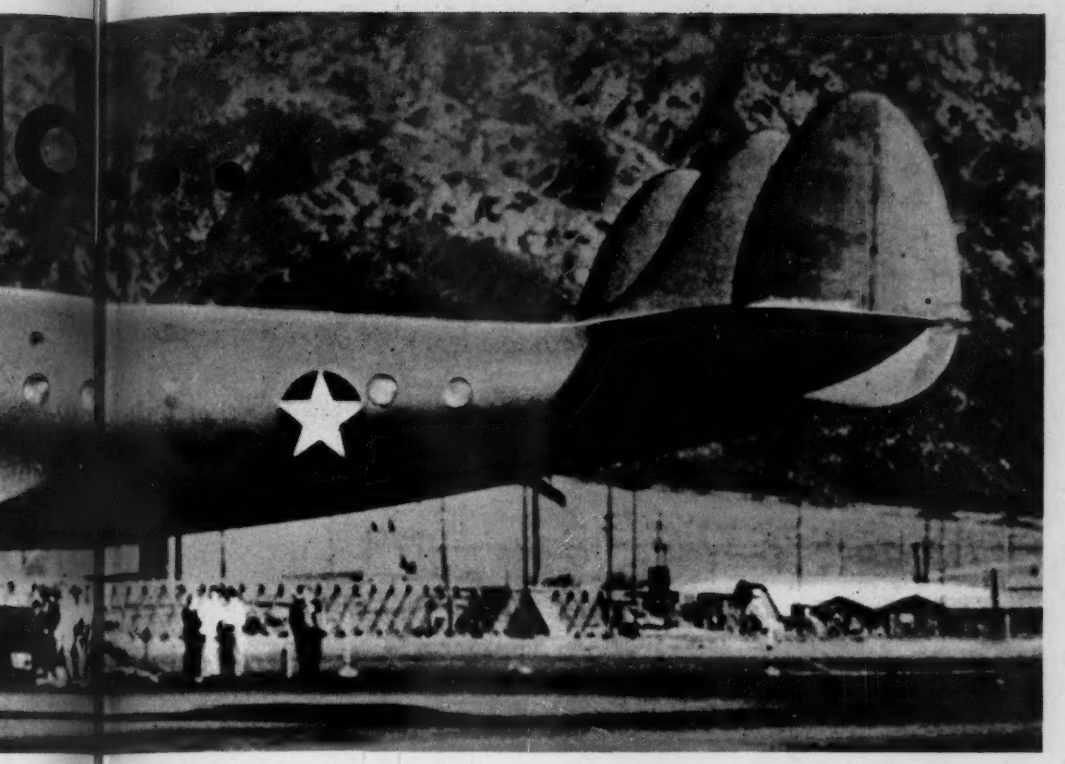
BLOWERS AND COMPRESSORS


ENGINES AND CONDENSERS

CENTRIFUGAL PUMPS

ALLIS-CH

SUPPLYING THE WORLD'S LARGEST LINE



er the Nation!

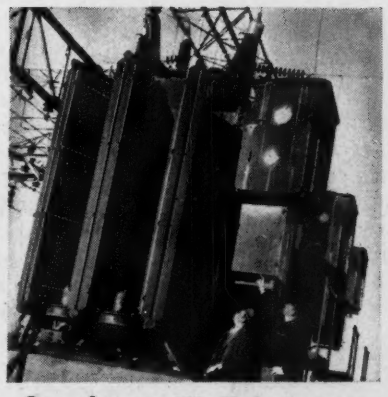
erate the tremendous electric power needed.

A-C motors, drives, controls keep production flowing . . . and Allis-Chalmers also produces equipment for making aluminum and removing precious magnesium from the sea.

1600 different industrial products come from this one company. And Allis-Chalmers engineers are helping plane makers and other manufacturers *produce more*, not just with new machines—but with *machines on hand!*

It's a tremendous job—and out of it Allis-Chalmers men and women are gaining experience that can mean better peacetime planes, better peacetime goods of all kinds.

ALLIS-CHALMERS MFG. COMPANY, MILWAUKEE, WIS.



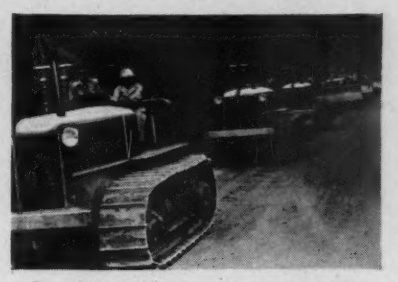
One of many Allis-Chalmers transformers that help transmit vital electrical power to U. S. war plants.

VICTORY NEWS

A-C Maintenance Booklets Now In Spanish, Portuguese! More than 200,000 Allis-Chalmers booklets on wartime maintenance of motors, pumps and rubber V-belts have been requested by men in industry whose job it is to keep machines running.

So great a demand has also come from South American countries that these booklets are now being printed in Spanish and Portuguese.

They are packed with practical information which is particularly helpful in training new men for the important job of making motors, pumps and rubber V-belts last longer during this critical war period. Write for your copies (English, Spanish or Portuguese) today.



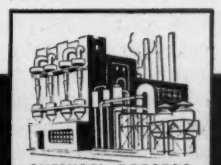
Good Neighbors get together! The picture above shows Allis-Chalmers equipment ready for an important road-building job near Rio de Janeiro.

A-C Aids Ship-Building Program: America's shipyards have already smashed every ship-building record in the book—and production of merchantmen and warships is still climbing.

A-C is one of the companies which is feeding these yards. It supplies a larger variety of equipment for ships than any other company in the U.S.A.

Belts, blowers, castings, condensers, control devices, generators, motors, turbines, rudders, complete hull sections, transformers, pumps are just a *few* of the items which we are supplying.

FOR VICTORY
Buy United States War Bonds



HALMERS

OF MAJOR INDUSTRIAL EQUIPMENT

WE WORK FOR VICTORY · WE PLAN FOR PEACE

HIGHWAY OF THE FUTURE

By CARROLL W. BOYCE
General Manager, The Tech Engineering News

Pictures courtesy Pennsylvania Turnpike Commission

THE Pennsylvania Turnpike which is considered by many a prototype of the highway of the future was projected primarily to break down the barriers formed by the Allegheny Mountains and to facilitate rapid movement of motor transport from the East-West centers of population. Because of this barrier, for many years prior to the construction of the turnpike, truck operators had been sending their trucks far from their direct path in order that they might avoid the hills and curves of the regular trans-Allegheny highways (U. S. Routes 11 and 30, the latter the famed Lincoln Highway).

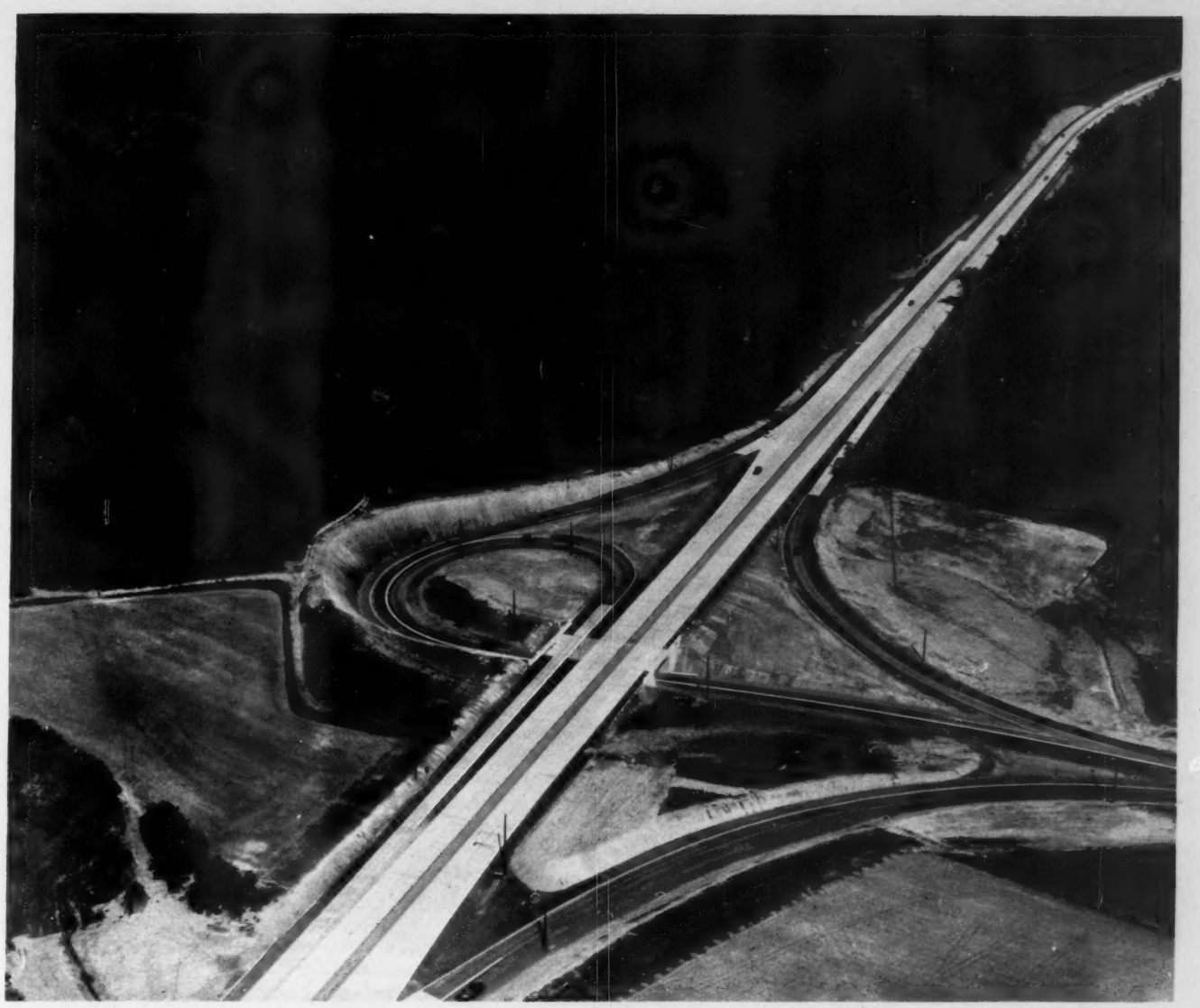
When completed, the Turnpike had not only accomplished its primary aim, but had also established a standard of design and construction of superhighways which will be the goal of other construction engineers for years to come. Perhaps the biggest reason for this is that the project backers were determined that they would not just build another road, but would build a road scientifically designed to meet a scientifically determined demand.

One of seven tunnels

Long before construction was begun, surveys were made to determine what volume of traffic might be expected on this new road, the nature of that traffic, and the things which that traffic would demand of the road. A long study was made to determine optimum operating conditions for various size and power trucks on varying grades. This research led to the conclusion that the least hold-up of traffic occurred when the hills were so designed that all vehicles on the road could proceed up them at a minimum of thirty-five miles per hour. And there is no grade on the road which a truck of recent make, if not overloaded, cannot take at thirty-five miles per hour!

Many people ask the question, why not go to a little additional expense and build the road so that a truck can maintain fifty or even sixty miles per hour. There are two very excellent reasons for this, one of which is at once apparent, and that is that all cars do not want to travel at that high speed, and that accidents increase greatly when part of the road population is travelling at one speed and part at another. On good roads there is perhaps no other factor so important a cause of accidents as the cars which travel either much faster or much slower than most of the traffic. The second factor in the determination comes as quite a surprise to most people. That is, that the carrying capacity of a road (the number of cars which can pass over it from end to end in a specified time period) is greatest with the speed of the cars between thirty-five and forty miles per hour. Greater than with the speed of fifty or sixty miles an hour! Extensive trials were made to determine the average distance between cars when travelling at several speeds, thus determining the "static" capacity of the road at those speeds. When these results were maximized against the time of transit for a given vehicle at a given speed, it was found that the "dynamic" carrying capacity was greatest at slightly less than forty miles per hour.

With this in mind, planning went ahead on a road over which all traffic would travel at a minimum speed



Blue Mountain traffic interchange

of thirty-five miles per hour over its entire length. It was to be built with no grade crossings, no intersections, no traffic lights, no steep grades, and no curves which could not be safely navigated at thirty-five. This was a tremendous order indeed when it is remembered that the terrain over which the road had necessarily to travel was very mountainous along its entire distance, and that the closest parallel road between the same termini (Harrisburg and Pittsburgh) had nine hundred and thirty-nine road and street crossings, twelve railroad grade crossings, as well as twenty-five traffic stop-lights.

The turnpike is, then, the first long-distance highway in America to be constructed with all these modern transportation necessities incorporated in its design.

One of the greatest innovations of the road is the arrangement of a sequence of curves so that the sharper curves are not encountered suddenly; that is, by providing progressive curves up to the sharpest curve required by this mountainous country — the use of spiral easements at the end of each curve increases the comfort and facility of driving. Yet in this adverse terrain, there are over one hundred and ten miles of straightaway and less than fifty miles of easy curvature in the entire length of the road.

Many advanced safety precautions have been incorporated into the design, such as proper super-elevations, "daylight" lighting of the traffic interchanges, tunnel approaches and tunnel interiors, and extra wide traffic lanes, clearly marked by reflectors on each side.

The lanes are each twelve feet wide; the two adjacent lanes provided for traffic in each direction have a wide "island" of hard soil between pathways of oppositely directed traffic. Outside the inlaid reflectors is a wide shoulder which permits cars to pull completely off the highway when stopped for repairs.

At the interchanges (there are no intersections) all traffic is directed on the right turn principle, and the design is such that after an oblique turn is made the motorist cannot become confused or lost because a single roadway marked out by curbs makes it impossible to get off the proper route. The typical procedure for exciting traffic is as follows: On approaching a point of exit, a large sign two miles in advance informs the motorist of the number and name of the interchange, the number of the state or United States road with which connection is made, and the distance. This sign, with corresponding distance corrections, is repeated one mile and one-half mile in advance of the interchange. Then twelve hundred feet before reaching the actual turn-out an additional twelve-foot lane (for slowing down) is added to the width of the road. Once in this lane it is merely necessary for the motorist to decelerate, make a right turn at the interchange, and follow the

(Continued on page 98)

THE TECH ENGINEERING NEWS

MANAGING BOARD

CARROLL W. BOYCE 10–44
General Manager

CURT B. BECK, 6–45
Editor-in-Chief

ROBERT M. GOULD, 6–45
Managing Editor

STAFF

RICHARD D. MARSTEN, 6–45
Publications Editor

HERBERT R. KAEWERT, 2–46
Treasurer

JOHN S. HOWKINS, JR., 6–45
Personnel Manager

GUNTHER S. FONKEN, 2–46
Literary Associate

RUSSELL K. DOSTAL, 2–46
Advertising Manager

ARTHUR LINZ, JR., 2–46
Circulation Manager

STANFORD A. FINGERHOOD, 2–46
Business Associate

REYNOLD A. GRAMMER, JR., 6–45
Associate Editor

ENGINEERING COLLEGE MAGAZINES ASSOCIATED

JAMES W. RAMSEY, *Chairman*
Eastman Kodak Company, Rochester, N. Y.

ARKANSAS ENGINEER
COLORADO ENGINEER
CORNELL ENGINEER
ILLINOIS TECHNOGRAPH
IOWA ENGINEER
IOWA TRANSIT
KANSAS ENGINEER
KANSAS STATE ENGINEER
MARQUETTE ENGINEER
MICHIGAN TECHNIC
MINNESOTA TECHNO-LOG
MISSOURI SHAMROCK
NEBRASKA BLUE PRINT
NEW YORK UNIVERSITY QUADRANGLE
OHIO STATE ENGINEER
OKLAHOMA STATE ENGINEER
OREGON STATE TECHNICAL RECORD
PENNSYLVANIA TRIANGLE
PURDUE ENGINEER
ROSE TECHNIC
TECH ENGINEERING NEWS
WAYNE ENGINEER
WISCONSIN ENGINEER

NAVIGATING IN VACUO

In this issue THE TECH ENGINEERING NEWS features an article on the "Highway of the Future," the Pennsylvania Turnpike between Harrisburg and Pittsburgh, Pennsylvania. While the Editors are still of the opinion that the Pennsylvania Turnpike is very nearly the prototype of the American highway of the not too distant future, something has come to our attention since the Turnpike article went to the printers which we feel would be of interest to those of our readers who like to speculate about post-war transportation.

Dr. Irving Langmuir of the General Electric Company's Research Department recently astounded the scientific press with the prediction that it is *now* within the realm of the practicably attainable to install a transportation network which will permit speeds of from two to five thousand miles per hour! A proposal that such speeds were, in themselves, attainable would be startling enough, but it was his assurance that we need not wait centuries or even decades to realize them that was the most amazing part of his entire revelation.

Quite different, this, from the modest one hundred or so miles per hour predicted for the post-war roads fashioned on the principles of the Pennsylvania Turnpike. And how does Mr. Langmuir propose that it be achieved? By simply eliminating the two factors which impede the progress of any moving body: gravity and friction. That sounds like a large order, but it is far from as impossible as it would seem at first inspection. Even the Turnpike has gone far in overcoming gravity, by simply setting its route along that path which is closest to level; in other words, no more up or down grade than is necessary to compensate for the difference in altitude between the termini of the path.

The problem of overcoming friction is, of course, more difficult. And the problem is entirely different on the earth than it is in the air. For earthbound transportation the goal is maximized earth or track friction, and minimized internal friction and vehicular inertia. The problem of reduced friction for air transport is complicated by the fact that a plane requires air for buoyancy, thus more or less setting an "upper limit" to stratosphere flying. But Dr. Langmuir, dissatisfied with the results produced by the retardation of even the rarefied air of the stratosphere, proposes flight in a vacuum!

To the person drilled in the principles of aerodynamics this would appear an absurdity, but the ever versatile Dr. Langmuir has an answer to even this. He would suspend the vehicle, magnetically, in a vacuum tube. The problem of vacuum-transportation is thus made one for the electrical rather than the aeronautical engineer. And the problem is practically non-existent, for the solution is simplicity itself. It is necessary only to establish a magnetic field which will produce a "side thrust" on the vehicle which is upward (providing suspension), and forward (providing propulsion in the desired direction). Acceleration and deceleration are then simply a problem of dynamic synchronization.

The theory, thus, is elementary. Not so, of course, are the practical aspects of construction and operation. Assume, for instance, that it was desired to operate such a route from New York to Los Angeles, and the vehicles are to have the carrying capacity of a standard railroad train. The "coach" would have to be air-tight, and of extremely rigid construction to withstand the difference in pressure between the cabin, maintained at atmospheric pressure for the comfort of the passengers within, and the near-vacuum in the tube itself. And the machinery necessary to maintain the low pressure in the tube would be tremendous. Construction of a vacuum-tube reaching from New York to Los Angeles, some three thousand miles, would be neither easy or inexpensive. Even the roughest calculation of the power needed to supply current for the electro-magnetic mechanism leads to results which stagger the imagination.

This is not an attempt to depreciate Dr. Langmuir's suggestion, for stranger things have come to pass in the last century. It is merely to point out some of the reather intriguing problems which will face the engineers employed on such a project. And the problems connected with this project which will face the financier and economist are ones of no mean proportion.

Yet the tremendously expanded productive capacity which America has attained during the war will undeniably bring even such a vast project as this, as Dr. Langmuir says, within the realm of definite possibility in the very near future.

To Irving Langmuir, and others with his foresight and vision, THE TECH ENGINEERING NEWS says, more power to you! C. W. B.

TELEPHONE lines from poles to homes take a terrific beating from old man weather. And with wire for replacements drafted for military use, existing lines must be kept in good condition.

Asphalt coating applied in time keeps out moisture, chief trouble maker on telephone lines. Without lowering the wires, this trolley painter speeds the coating—helps recondition 50 lines a day.

This simple "stitch in time" helps keep communications open to the homes of America—and saves critical materials for vital war weapons.

War calls keep Long Distance lines busy . . . That's why your call may be delayed.

ALUMNUS OF THE MONTH

ALFRED P. SLOAN, '95

Chairman of the Board, General Motors Corporation

This is the last of the biographies of the "big three" of the class of '95, Dr. William Coolidge, Gerard Swope, and Alfred Sloan. However, T. E. N. plans to continue its series of biographies of prominent alumni of the Institute in future issues. — ED.

Alfred P. Sloan, Jr., was born in New Haven, Connecticut, on May 23, 1875, one of five children. He entered Massachusetts Institute of Technology in 1892 and through dint of hard labor, graduated in the class of '95, one year ahead of time, along with two other electrical engineers, Gerard Swope (T. E. N., November 1943) and William Coolidge (T. E. N., October 1943).

Upon graduation from M. I. T., he took a job as a draftsman with the then infant Hyatt Roller Bearing Company, where one of his first duties was to develop a patent for making billiard balls. The automobile industry was just coming into importance, however, and it soon became evident that the greased axle would have to be replaced by something more efficient. Roller bearings were indicated, and it fell upon Sloan to step out of his draftsman's job to develop the automobile roller bearing. Having developed it, he raised funds to finance its manufacture, then went out and sold it to the automobile industry. He was raised to President of the Hyatt Roller Bearing Company in 1897, at the age of twenty-two. In this capacity he met many heads of the automobile industry, contacts which were to mean much to him in later life. In 1916, the Hyatt Company was bought out and consolidated into a new corporation, the United Motors Corporation, and he received half interest and was made Vice-President. When United Motors became part of General Motors in 1918, Sloan was made Vice-President in charge of accessories of the latter firm; in 1920 he was placed in charge of the Corporation's workings as Operating Vice-President; and in 1923 he was elected President succeeding Pierre du Pont. Here indeed is a tribute to management ability.

In 1937 he announced a personal gift of $10,000,000 to the Alfred P. Sloan Foundation, which he had established some time earlier "for the purpose of promoting a wider knowledge of basic economic truths generally accepted as such by authorities of recognized standing and as demonstrated by experience, as well as a better understanding of economic problems in which we are today so greatly involved and to which we are so importantly concerned." This meant mainly the encouragement, through financial grants or otherwise, of such activities in the fields of education and research, and it was through this fund that the Alfred P. Sloan Automotive Engine Laboratory was established here at M. I. T.

Mr. Sloan served as President of General Motors until 1937, at which time he was elected Chairman of the Board. On the same date he was elected Chairman of the Policy Committee and of the Administration Committee, now the War Administration Committee, of the Corporation.

Alfred Sloan is perhaps one of the most outstanding members of the new school of corporation executives. He is the antithesis of the "sledge hammer" type of business man. Though he does not lack force, force is not his forte. He has attained his present position through hard work, the ability to arouse the initiative of the men under him, and his desire to search "aggressively, with an open mind, for the fundamental truths in the broader relationship of industry to society." In him industrial statesmanship has replaced aggressiveness; his diligent, whole-hearted, personal attention to the job at hand typifies his philosophy of business management.

His actions speak eloquently for the inherent ability and character behind this leader of industry. A noted commentator once said about him, "I think Mr. Sloan's outstanding quality must be his ability to concentrate on a job and follow it through to a conclusion." This is illustrated by the fact that his life is divided almost exclusively into trips between New York and Detroit and the various other plants of General Motors. Several times a year he sends out a personal letter to stockholders in the General Motors Corporation describing its present activities. His humanitarianism manifests itself through such outlets as the Sloan Foundation and his many personal gifts such as the $25,000 which he contributed to the Automotive Safety Foundation in 1938 to be used in the promotion of highway safety.

Mr. Sloan includes among his activities life membership in the Corporation of the Massachusetts Institute of Technology. He personifies the result of the kind of training M. I. T. would like to give to all its students. This great leader represents the new era of humanitarianism in business towards which industry is gravitating, an era leading to the ultimate betterment of humanity.

Stepping Up... and Keeping Up the STEEL CUTTING PRODUCTION *of the United Nations*

WITH the outbreak of war in 1939, the Allied Nations—abruptly cut off from Germany as a principal source of supply for carbides—diverted the full flood of their carbide demands to the United States.

Fortunately, American industry had established—as far back as 1928—its own independent sources of supply. These American suppliers were ready to meet the emergency with a background of 10 years' experience in the development, manufacture and application of this urgently needed material. They had the skill, the equipment, and a generous margin of reserve capacity.

To the hard pressed Allied Nations—struggling to offset the tremendous output of a German war production long since tooled with carbide *by official decree*—went tons of American carbides in steadily increasing quantities. Foresight and preparedness enabled American carbide manufacturers to fill this urgent need and at the same time meet the pyramiding demands of domestic industries.

Today, you will find carbides a factor of vital importance in stepping up and keeping up the production of not only the United States but also such countries as England, Russia, Australia, Canada, China, India, Mexico and many others among the United Nations.

The full extent to which carbides are being used in the cause of victory is difficult to visualize. Carboloy Company production alone, for example, is at an annual rate 45 times greater than that of any pre-war year. Monthly production of carbides—formerly measured in pounds—can today be expressed in tons—many tons per month! Yet the average carbide tool contains but a fraction of an ounce of carbide at the cutting edge—and a single tool during its usable life machines hundreds of parts for the implements of war. Particularly important is the use of carbides for cutting steel—a major field of use for Carboloy tools. (More than 60% of the Carboloy Cemented Carbide produced today for machining purposes is for cutting steel.)

A high order of performance—so high as to have been once considered incredible—is now commonly expected, and obtained, with carbides. Such things as increases in output of 3 to 1, lengthened tool life of 10 to 1, finish cuts that eliminate arduous grinding, machining of former "non-machineable" alloys, reductions of 25%, 50%, 75% in machining costs—results such as these are every-day occurrences in war production today.

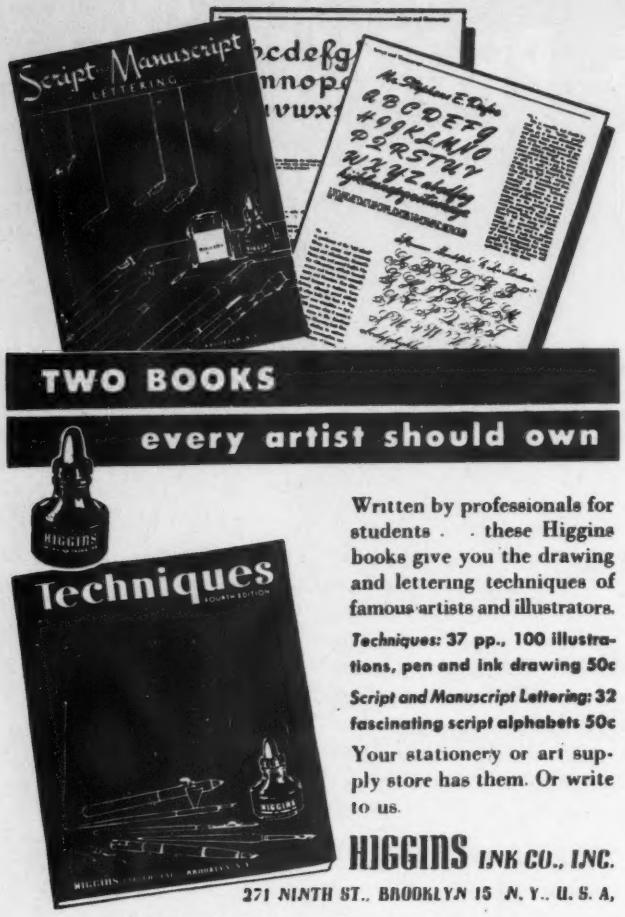
This widespread use of carbides in war, indicates a new era of production economy when normal commerce returns. Manufacturers who have converted to carbides to meet the present emergency will then have at their immediate disposal an economic weapon of unusual advantage in seeking world markets.

Carboloy Company, Inc., Detroit, Mich.

Authorized Distributors: Canadian General Electric Co., Ltd., Toronto.
Foreign Sales: International General Electric Co., Schenectady, N. Y.

CARBOLOY
TRADEMARK

TITANIUM — TANTALUM — TUNGSTEN CARBIDES



Written by professionals for students . . these Higgins books give you the drawing and lettering techniques of famous artists and illustrators.

Techniques: **37 pp., 100 illustrations, pen and ink drawing 50c**

Script and Manuscript Lettering: **32 fascinating script alphabets 50c**

Your stationery or art supply store has them. Or write to us.

HIGGINS INK CO., INC.

271 NINTH ST., BROOKLYN 15 N. Y., U. S. A.

TOMORROW'S CALENDAR?

(*Continued from page 86*)

April 8, historians' most recent approximation to the exact anniversary of the Resurrection. Thus the post-Easter postponement of purchasing would always come after the eighth of April and not anywhere between the twenty-second of March and the twenty-fifth of April. For the necessary stocks of merchandise, for example perishable foods, can be more easily estimated if the merchant could compare any date with a date corresponding exactly in previous years.

The small business man is by far not the only one who would benefit by calendar reform. With all days the same, holidays can be put either on a Monday or a Friday, thus incorporating them into the week-end, and avoiding costly mid-week shutdowns. Another important improvement is the four quarters into which the year would be divided, which will greatly simplify the methods of accounting.

The government and the law profession will also benefit by the new plan. The data upon which all the wartime (and after war, peacetime) agencies base their policies would be easily comparable to former years' figures, thus rendering the formulation of future decisions much simpler. The obvious benefit to those concerned with laws, contracts, legal dates, etc. scarcely need be mentioned. The division of the year into unequal quarters has long been a thorn in the side of all those engaged in any legislative or legal activities. Summing up, the legal profession is one of which the very nature depends upon accuracy, conciseness, and an absolute maximum of coördination and efficiency, all of

(*Continued on page 98*)

Did You Know . . .

(*Extracted from President Compton's Report to the Corporation*)

THAT . . . .

There are now over 4,500 students taking academic courses at the Institute, as compared with only about 3,100 in a normal pre-war year . . . an increase of nearly 50 per cent.

THAT . . . .

Of these 4,500 students, more than 3,000 are members of the United States Armed Forces who have been detailed to the Institute for the purpose of getting special technical training at Government expense.

THAT . . . .

The Institute staff and employees now number approximately 4,300, an increase of almost 300 per cent over the peace-time staff of some 1,100.

THAT . . . .

Last year the Institute spent almost $23,000,000, in marked contrast to its usual pre-war expenditure of about $4,000,000.

THAT . . . .

The Institute had added or is in the process of adding more than 16 acres of floor space to house its increased educational and research programs.

THAT . . . .

The Institute will make no direct financial gain from any war research being carried on here which results in inventions of a patentable character. President Compton stated that "in the large contracts which are carried on chiefly by staff widely recruited from outside the Institute, we have felt it improper for the Institute to acquire any special benefit from patents. . . . All employees under the contract are required to disclose and assign their investigations to the Institute, which in turn offers them freely to the government through the Office of Scientific Research and Development."

THAT . . . .

Despite suggestions and possible action by other institutions to the contrary, the Institute does not plan to continue the "accelerated" program after the war. President Compton explained that "No one questions the advisability of this accelerated program under present war conditions. Some people are suggesting the desirability of continuing permanently on this accelerated basis after the war. . . . We do not share this view, believing that the best interests of all concerned will be served by our returning to the normal schedule as soon as circumstances permit."

* * * * *

THAT . . . .

Three new life members of the Corporation have recently been elected. They are:

William S. Newell, '99, President of the Bath Iron Works Corporation, Bath, Maine.

Louis S. Cates, '02, President of the Phelps Dodge Corporation, New York.

Marshall B. Dalton, '15, President of the Boston Manufacturers Mutual Fire Insurance Company.

They have all served previously as term members of the Corporation.

THE TEAM THAT BUILT A THOUSAND SHIPS

IN the short space of time since Pearl Harbor, more than a thousand 10,000-ton Liberty ships have been built in America's shipyards.

Two things are chiefly responsible for this epic production achievement: the resourcefulness of our shipbuilders and new mass production methods made possible by the oxyacetylene flame and the electric arc.

By widespread use of revolutionary pre-fabrication techniques, America's shipbuilders have created a gigantic fleet of cargo ships which are now helping to turn the tide of war in our favor.

In many other vital fields of industry the oxyacetylene flame and the electric arc have played equally important roles. And their proven efficiency and economy in war production foreshadows the important place they will assume in peacetime manufacturing.

Air Reduction research and engineering has made many important contributions to the development of oxyacetylene and electric arc processes. If you would like to receive our informative publication "Airco in the News," we shall be glad to send you a free copy. Address your request to Mr. G. Van Alstyne, Dept. C. P., Air Reduction, 60 East 42nd Street, New York 17, N. Y.

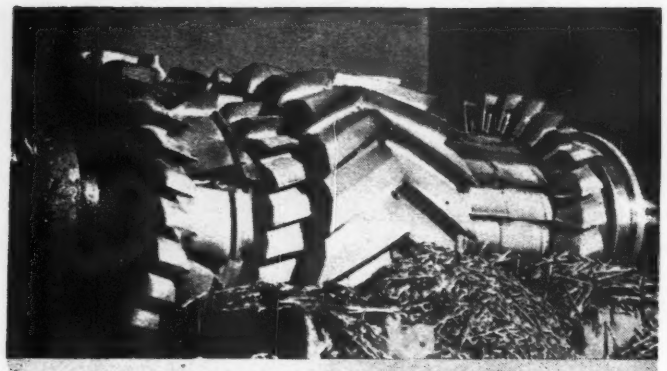
SEND FOR FREE BOOKLET "AIRCO IN THE NEWS"

AIRCO WILSON

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON, TEXAS



Cutters Give You More Production When You Give Them More Care

Make cutters last longer and serve better by correct handling and sharpening as well as by proper care in operation.

Cutters are scarce these days — they need extra care so that the production requirements for our armed forces can be maintained.

We are proud to be honored with the Army "E" awarded for outstanding accomplishment in defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U.S.A.

BROWN & SHARPE CUTTERS

TOMORROW'S CALENDAR?

(*Continued from page 96*)

which the well-ordered World Calendar would provide.

In the world of finance the same benefits apply as do to law. The equal quarter modification is especially attractive, since it will equalize the period of loans, usually computed upon a quarterly basis. As in the case of statisticians, the use of graphs would be greatly simplified and the graphs themselves would be much more significant, since every month is comparable with the corresponding month of any other year.

One of the most delicate issues of calendar reform concerns religion. A few changes in the exact relation of religious dates to dates in the Gregorian system would have to be tolerated, but these should be inconsequential. The World Calendar changes only six days or dates in the present calendar year of 365 days. They fall between February 28 and September 1. The six months from September 1 to February 28 continue as today. The changes are two new days (twenty-ninth and thirtieth) in February; the thirty-first of December, regarded as the double or extra Saturday, becomes the permanent World Holiday (Year-End Day). Notwithstanding, the Protestant Episcopal Church, the Council of Bishops of the Methodist Church, and independent rabbis and priests of the Jewish and Catholic Churches have given their approval.

Of most interest to readers of T.E.N., the 12-month Equal Quarter plan has the unanimous approval of scientists. For, as a result of actual consideration by international commissions and scientific bodies, science has shown overwhelming favor for this plan. Professor Harlan T. Stetson, in charge of the Cosmic Terrestrial

(*Continued on page 100*)

HIGHWAY OF THE FUTURE

(*Continued from page 91*)

one-way road around to its intersection with the outside route.

A similar arrangement exists for entering the Turnpike. Where the feeder route enters the pike, a third lane or "acceleration" lane parallels the regular road for twelve hundred feet, thus allowing the motorist to gain speed, and thus enables him to enter into the flow of traffic at a speed comparable to that at which the bulk of the traffic is moving. This parallel lane also serves the function of providing full view to the entering motorist, and thereby reduces considerably the number of accidents which might be expected at a point of entrance onto a high speed highway.

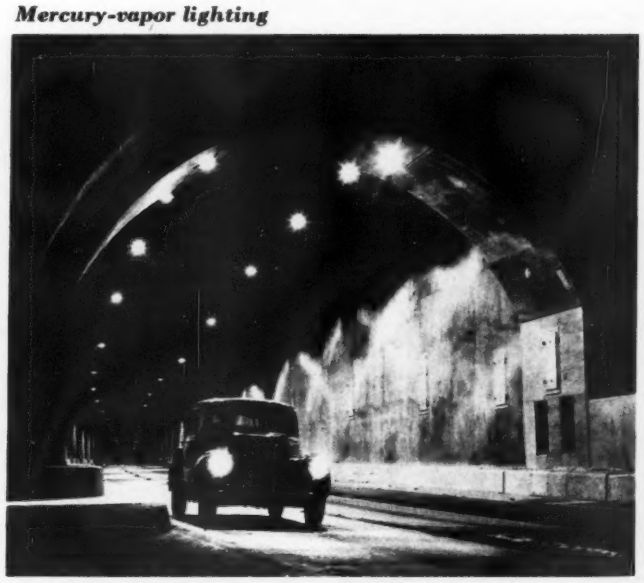
At night these interchanges are illuminated by sodium-vapor lights, the best imitation of actual daylight which science can produce for this use. The outside approaches of the tunnels on the Turnpike are similarly illuminated, but the insides of the tunnels are equipped with mercury vapor lights. This combination results in a very advantageous contrast on approaching the tunnel entrance. The whiter light of the mercury arc sets off the tunnel entrance in perfect silhouette against the yellow light of the sodium arcs on the outside. It would be impossible to analyze quantitatively the psycological advantage to the night driver of this clear demarcation of the tunnel entrance. This advantage assumes even greater proportions in the light of the fact that the tunnels are not as wide as the roadway itself, and it is therefore essential that the driver be made aware of this fact, quantitatively, as soon as possible.

Along the route of the Turnpike there are seven great tunnels, with a total length of over 6.7 miles. Four of them are over a mile in length. The longest is the "Sidling Hill" tunnel, 6,782 feet, and the shortest is "Rays Hill," 3,532 feet. These seven tunnels alone save over 9,000 feet of vertical climb over existing routes.

The design and construction of all the tunnels is uniform throughout. Two traffic lanes are provided, each being 11½ feet wide. The tunnel itself is 28 feet six inches wide, and from roadway to ceiling 14 feet four inches high with an airshaft in a seven-foot segment of the concrete arch above ceiling. A two-foot nine-inch emergency walk is provided throughout the entire length of all the tunnels. Buildings housing the

(*Continued on page 102*)

Mercury-vapor lighting



WAR

has exploded the German chemical myth

This is the Chemical Age and many people believe that Germany is *the* chemical nation. Yet history shows that the synthetic organic chemical industry really started in England, got much of its early impetus in France and has reached its greatest development right here in America.

Germany undoubtedly contributed vast research . . . and vast propaganda . . . but she made the mistake of trying to make it a German monopoly, through Government subsidies and control. There is a profound lesson for us in that.

The American chemical industry, operating on private capital, has pulled out of the test tube miraculous new medicines to save life, super-powerful explosives to overthrow dictators, marvelous new materials that Nature never dreamed of. America now has the greatest organic chemical industry in the world.

Koppers is one of the great raw materials sources for the chemical industry. Coal tar chemicals go into the new explosives, into the new wonder-working medicines, into the new plastics, into more productive agriculture.

Koppers is the largest builder of coke ovens, in which coal is processed to yield raw materials for the coal tar chemical industry . . . it is one of the largest producers and distillers of coal tar . . . one of the foremost designers and builders of recovery plants from which come the materials for use in medicines, explosives, plastics, synthetic vitamins, synthetic rubber and other chemical wonders. An affiliate of Koppers is one of the largest independent coal producers in America.—Koppers Company, Koppers Building, Pittsburgh, Pa.

KOPPERS

THE INDUSTRY THAT SERVES ALL INDUSTRY

INGOTS GO TO WAR!

THE HARRISBURG STEEL CORPORATION produces thousands of tons of carbon and alloy steel each year, practically all of which is now used in the manufacture of materials of war for the Armed Forces of America and her Allies.

From Harrisburg's modern open-hearth furnaces, carefully controlled heats of molten steel are carried to the pits by huge ladles that pour it into giant molds. These molds form the ingots of precious steel . . . steel that is now "going to war" but will be used to make Harrisburg's famous Seamless and Drop-Forged Steel Products.

To make these quality products the steel itself must be right. That is why Harrisburg makes its own carbon, alloy and special steels. That is why Harrisburg products are right from the start . . . supervision begins at the open-hearth and ends only at the point of shipment.

Today Harrisburg sends its Steel Ingots to War but when Victory is ours these same ingots will again be used in the manufacture of peacetime products . . . products that have been sold in the markets of the world for over ninety years.

HARRISBURG MAKES: Alloy and Carbon Steel Billets, Seamless Steel Cylinders, Liquefiers, Pipe Couplings and Pump Liners, Hollow and Drop Forgings; Pipe Flanges.

Buy Bonds for Bombs and Bombers

HARRISBURG STEEL CORPORATION
HARRISBURG · PENNSYLVANIA

TOMORROW'S CALENDAR

(*Continued from page 98*)

Research Laboratory here at M.I.T., is one of the many scientists who have endorsed the plan and who believe actively in it. Professor Stetson was Secretary of the American Association for the Advancement of Science when this body passed unanimously a resolution for the adoption of the 12-month Equal-Quarter Calendar (The World Calendar). President Compton of the Institute was also President of the A.A.A.S. at the time. Beside the approval of the A.A.A.S., this plan has been approved by a committee of international scientists under the supervision of the League of Nations and several American scientific and technical societies.

The only hindrances at present to the adoption of the 12-month Equal Quarter plan is the general feeling of apathy to such a change which world powers like Great Britain and the United States bear. Fourteen other countries, including China, Norway, Turkey, Greece, Mexico, and Brazil, have signified their endorsement of the World Calendar idea. But it is still up to one of the larger world powers to start the ball rolling. The logical time for this conversion will be the year 1945, whose New Year's Day corresponds exactly with the World Calendar's New Year's Day. There has been considerable feeling for making the change to the simplified calendar, and it seems highly probable if war matters are not too pressing, that something may be done about adopting the World Calendar at the end of 1944. For calendar reform has many disciples in high places (such as Mahatma Ghandi, who said that anything that might help to unify the Indians would have his support) and the World Calendar plan has so far been the most acceptable one yet drawn up. Once the apathy to change and the conservatism so prevalent before the war are broken down this plan may be accepted. It is a certainty that such a change is a necessity, for our old calendar has proven itself unsatisfactory for many centuries. The Editors of TECH ENGINEERING NEWS would like to go on record officially for the World Calendar plan as put forth in this article, for we believe it to be a necessity for the better world towards which mankind is eternally striving.

We know what's happening on your campus

Here's what's cooking on ours

We're very much aware of what you are doing.

It's because we are grateful that we want to tell you this.

You've never known industry—not really well. It's probably still a vague place that makes things you buy. You probably think of us as just a place aluminum comes from . . . the aluminum that makes the planes you are going to work with.

But we're people—fathers and older brothers, mothers and sisters, doing the most interesting work we know.

When you come back you'll see this other side of industry. You'll see people figuring out what they can do to make a better world, and you will want to join them, doing something to make the peace rich and worth the fight.

There will be a great many things to be done. A lot of them will be done with aluminum.

Think of all the things the world is going to want in a hurry. A great deal of them will be shipped by air. So they'll be as light as possible. That's one reason why they'll be aluminum.

Millions of things are waiting for someone to make them lighter or more resistant to corrosion, brighter, prettier, cheaper. They'll be made of aluminum, too.

None of that can start till the war's over. But just as soon as our wartime job is done, we mean to make aluminum make a lot of jobs.

And that's what's cooking on our campus. We're studying right now ways of making those jobs. Some of them, we hope, will be right here at Alcoa Aluminum. Still more will be in industries using aluminum for the first time. Wherever they are, they should be exciting.

A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF

ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.

POWER FOR
WAR MACHINERY
The expansion of existing industrial plants, plus the addition of new ones, put an unprecedented burden upon the power plants of the country. But the power industry had foreseen this enormously increased demand for power and had adequate facilities ready to meet it.
We take pride in the service rendered by B&W boilers in this noteworthy achievement of the Public Utilities in meeting this unprecedented demand.
Get Acquainted
To acquaint engineering students with the many types of boilers and their uses in various services, we will send on request a copy of a factual booklet, "The Design of Water-Tube Boiler Units."
BABCOCK & WILCOX • THE BABCOCK & WILCOX COMPANY
85 LIBERTY ST., NEW YORK, N. Y.

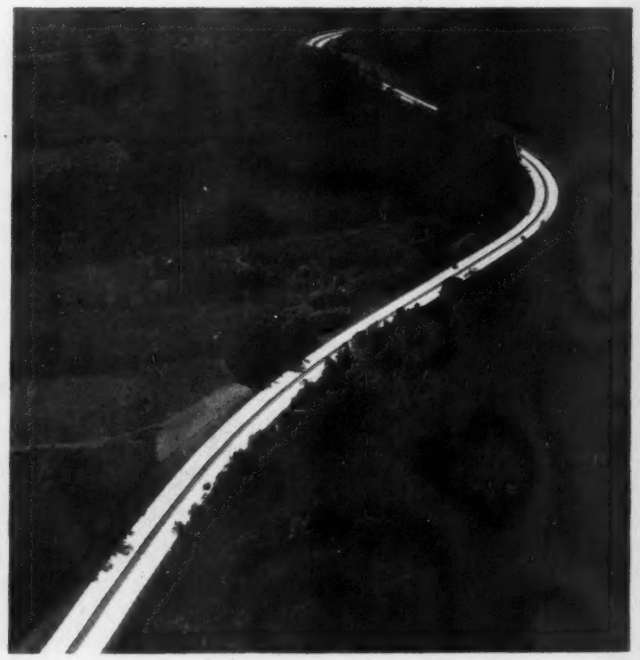
HIGHWAY OF THE FUTURE

(Continued from page 98)

ventilation equipment are located at each end of all the tunnels, except Rays Hill where but one end is so equipped. Housing fans capable of delivering four times more air than is used in the largest blast furnaces, the supply of fresh air in the tunnels is far in excess of the ventilation requirements of the State law. In case of power failure, all tunnels are provided with a secondary source which cuts in automatically with regular incandescent lighting fixtures.

Although the Turnpike is still being operated as a toll road, the savings affected by its use are attested to by the fact that many trucking concerns now use it to the exclusion of other routes for their long East-West

(Continued on page 104)



OUR APOLOGIES . . . . .

In the rush of putting out the November issue during the examination period, we failed twice to give credit where credit was due:

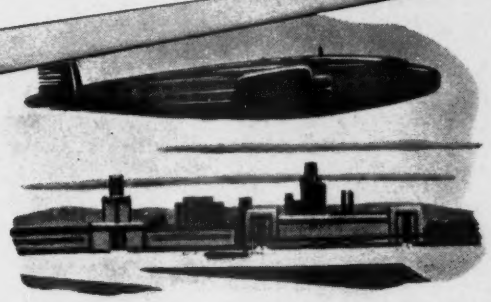
To the Allis-Chalmers Electrical Review, for the picture "Giant Spindles" which appeared on pages 52 and 53.

To the General Electric Company, for the pictures and diagrams accompanying the article "The Well-Bred Short Circuit," by Richard D. Marsten, which appeared on page 44.

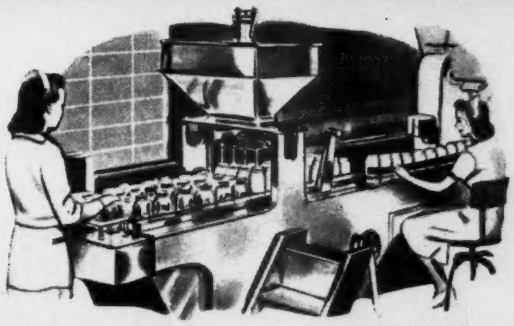
With our many thanks for these fine pictures go our sincere apologies for the oversight.

THE EDITORS

Filling Prescriptions with Steel!



1. BETTER STEELS! This country needs aircraft that fly high and far . . . and hit hard. It needs ships in great numbers. It needs tanks that can take it when the going gets tough. It needs equipment to outperform any on earth. All these things require many special steels. Such steels with needed properties are created through the use of *alloys*. Basic peacetime research by ELECTRO METALLURGICAL COMPANY, a Unit of UCC, has developed many important steels and the alloys to make them, such as chromium, silicon, manganese, vanadium, tungsten, calcium, and columbium . . . all vital today.



2. STAINLESS STEELS! The development of steels of high chromium content gave designers and engineers a whole family of new materials with which to work. Such steels resist rust and corrosion, and are easily kept clean. They are essential in the food industry. Possessing great strength in addition to their corrosion resistance, they save weight in trains and planes. They have brought improvements in the oil, chemical, textile, and other fields...with resultant savings to you. Low-carbon ferrochromium, an Electromet development, is essential in the large-scale production of stainless steels.

3. NEW NATIONAL RESOURCES! Tungsten and vanadium are essential to steelmakers. Long before war clouds loomed, many felt that more of this country's domestic sources of these metals should be developed. Engineering research by UNITED STATES VANADIUM CORPORATION, another UCC Unit, found efficient ways of refining low-grade ores. This enabled U. S. VANADIUM to revitalize old mines with new mills and methods, and make America less dependent on foreign sources for her increased needs of tungsten and vanadium.

4. BUILDING TOWARDS THE FUTURE! Alloy steels offer still greater promise for the future. Bridges and other structures will be made still lighter, stronger, and longer-lasting by wider use of some of the steels with which engineers are already experienced. Trains, trucks, and aircraft will be made lighter, stronger, faster, and safer. Better cars and tractors, homes and home equipment will be made through their use.

Units of UCC do not make steel. They do make ferro-alloys used to purify and give special properties to steel. They also make non-ferrous alloys which, because of their exceptional resistance to wear, heat, and corrosion, are used as cutting tools, hard-facing welding rods, and for other purposes. UCC research and developments mean ever-new and improved alloys for industry . . . and ever-better products for you.

BUY UNITED STATES WAR BONDS AND STAMPS

UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street UCC New York 17, N. Y.

Principal Products and Units in the United States

ALLOYS AND METALS
Electro Metallurgical Company
Haynes Stellite Company
United States Vanadium Corporation

CHEMICALS
Carbide and Carbon Chemicals Corporation

ELECTRODES, CARBONS AND BATTERIES
National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

OKOLITE-OKOPRENE
Okoseal
Neoprene Jacketed Wires and Cables
Technical data on new synthetic insulated cables for engineering students . . . .

Our research and engineering departments have prepared and published many technical papers discussing these developments and improvements. To mention a few of these papers:

Okolite-Okoprene — neoprene-protected cables
Hazakrome Handbook — on thermoplastic building wires
Okoseal thermoplastic insulation
Neoprene Jacketed Wires and Cables

THE OKONITE COMPANY

We will be glad to mail a copy of all of these papers to any interested engineering student. Just write to: 3302

INSULATED WIRES AND CABLES

EXECUTIVE OFFICES: PASSAIC, N. J. • OFFICES IN PRINCIPAL CITIES

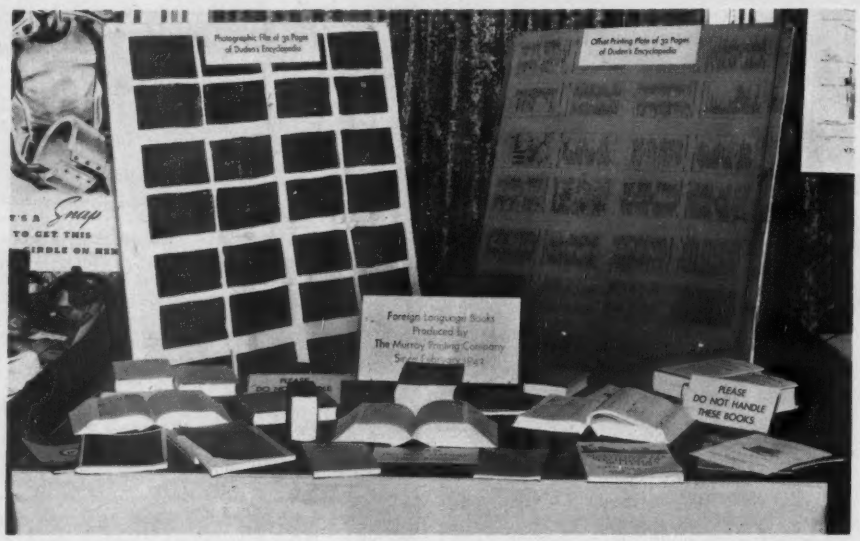
HIGHWAY OF THE FUTURE

(Continued from page 102)

hauls. They agree that the savings in fuel, tires, maintenence (due to easier driving and hence less wear and tear on equipment), bigger pay loads with lower-powered trucks, and increased safety more than compensate for the toll.

In the opinion of many the Pennsylvania Turnpike represents the greatest advance thus far in modern road construction in America. There are undoubtedly improvements which can be made over the Turnpike in subsequent constructions on this scale, but the Turnpike has been the pioneer, and its value in that respect is inestimable.

Although the passenger traffic over the Turnpike is negligible today, because of war restrictions, the existence of this traffic artery has been of great value to the war effort, for over this "highway of the future" is flowing a steady stream of the sinews of war, on their way to the front, and getting there safer and faster over this modern Allegheny Trail.

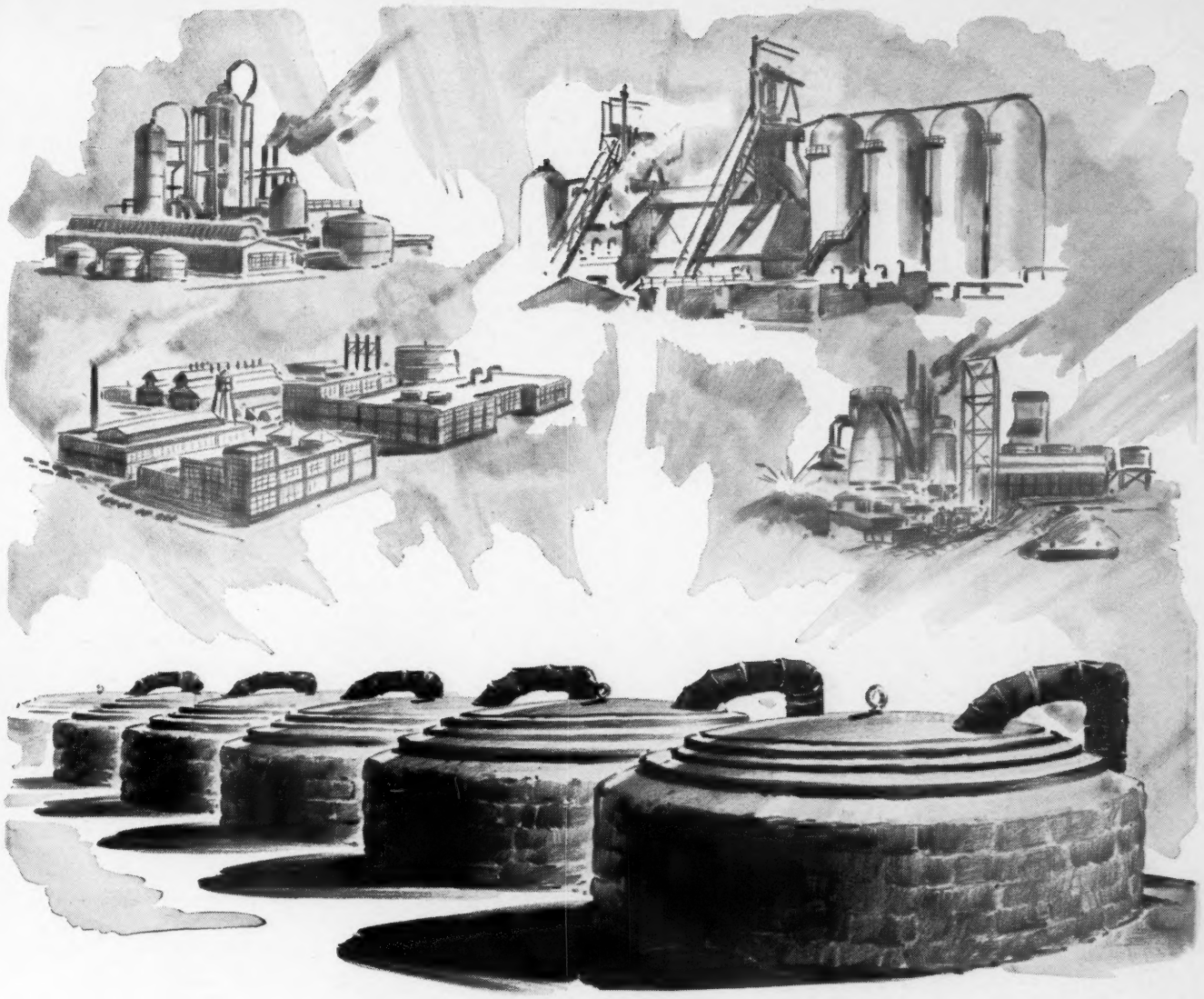

Photographic Film of 32 Pages of Duden's Encyclopedia
Offset Printing Plate of 32 Pages of Duden's Encyclopedia
Foreign Language Books Produced by The Murray Printing Company
PLEASE DO NOT HANDLE THESE BOOKS

OUR DISPLAY OF FOREIGN LANGUAGE BOOKS AT CAMBRIDGE WAR DEFENSE EXHIBITION

In the past two years our plant has manufactured over twenty-five volumes in foreign languages, from books of 200 pages to 3,000 pages. Some of these books are now going through on third editions

THE MURRAY PRINTING COMPANY

18 AMES STREET, CAMBRIDGE, MASSACHUSETTS



CAUSTIC SODA—a key chemical in industrial growth

Caustic Soda is an indispensable chemical needed by industry in huge quantities. A long list of products—notably petroleum, soap, paper and textiles—use it as an essential material in various manufacturing processes. The production and availability of this hard-working chemical are consequently of genuine importance.

Following the course dictated by its own initiative, Dow began many years ago to specialize, step by step, in the chemistry of brine. Original methods for the production of bromine led to chlorine, and the process for making chlorine produced caustic soda as a co-product. During the intervening years, Dow has become one of the leading producers of this key chemical, with plants so strategically located that they are prepared to serve the entire nation.

This development is cited merely to emphasize the importance of self-reliant enterprise.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Cleveland • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

CORNELL UNIVERSITY
JAN 5 - 1944
LIBRARY

G-E Campus News

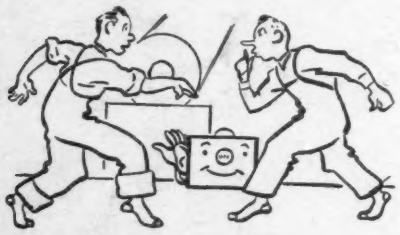
RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD

PAINTING THE FUSE RED

WHEN General Electric's automatic X-ray machine, developed to check the proper amount of powder in hand grenade fuses, "sees red" there's too little powder in the fuse, and the grenade might explode as soon as the soldier released his grip on its handle.

For checking, the fuses are set upright on a movable belt that passes through the machine. The perpendicular beam of a 100,000-volt X ray penetrates each fuse and produces a glow on a fluorescent screen, above which is a phototube or "electric eye." As long as this glow remains constant, the fuse passes through untouched. But when a fuse with a light powder charge passes over the X-ray beam, the phototube detects the change in the glow, automatically rings a bell, flashes a red light, places a dab of red paint on the top of the fuse, and records the dud on a chart. This four-way check makes it impossible for a bad fuse to get by without detection.

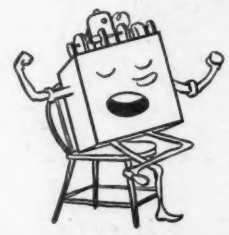
This machine, the first of its kind in the country, will automatically check 4000 fuses an hour.



SH–H–H

TO help make "all quiet" on the factory front—at least as much as possible—General Electric has developed a new sound-level meter that gives a quantitative measurement of sound.

Because man's nervous system is severely agitated if he is subjected to a sound above 120 decibels, the efficiency of factory workers is often lowered considerably by machinery noise. Highly sensitive, the instrument's range of 24 to 120 decibels covers the normal range of man's hearing and warns when the noise is harmful. Thus proper steps can be taken to reduce the sound.



YAWN PATROL

ON guard against over-fatigue of metals is the new electronic machine developed in our General Engineering Laboratory.

For metals, like human beings, get "tired" after a certain amount of work. One of the most important metallurgical tests is determining how much stress and strain certain metals can take under continuous vibration.

Energized by especially powerful electronic equipment, the new machine can vibrate a sample of metal back and forth about 10 million times in five hours—or in one-fourth to one-tenth the time previously required.

Hear the General Electric radio programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.

GENERAL ELECTRIC

963-74-211

192,000 employees of the General Electric Company are on their jobs producing war goods and buying over a million dollars of War Bonds every week to hasten victory.

THE MURRAY PRINTING COMPANY
AMES STREET, CAMBRIDGE